

Some Important Veterinary Publications

1. THE VETINFILE : (Book Journal)
Published by the Editorial Board of Imperial Chemical Industries Ltd., London, based on modern veterinary information, written and produced in co-operation with registered Veterinary Surgeons of the World. Features include specific diseases with special reference to Therapeutic-measures of Cattle, Sheep, Horses, Goats, Pigs, Dogs and Cats. Up to date with quarterly supplements ending June '61 ... Rs. 185.00
(Can be sent on approval)
2. HUNGERFORD : Diseases of Livestock ... „ 60.00
3. GALLOWAY : Infectious Diseases in Domestic Animals, Vol-I Virus Diseases due to Bacteria ... „ 120.00
4. RENSBURG : Breeding Problems and Artificial Insemination ... „ 25.00
5. RICE : Breeding and Improvement of Farm Animals ... „ 20.00
6. MAYNARD : Animal Nutrition ... „ 15.00
7. BLOOD : Veterinary Medicine ... „ 63.00
8. W. POOL : Veterinary Annual, 1960 ... „ 31.50

★

Please order on :

British Book Depot

84, HAZRATGANJ — LUCKNOW, (U.P.)

When writing to advertisers, please mention *The Indian Veterinary Journal*.

THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE INDIAN VETERINARY ASSOCIATION]

PUBLISHED MONTHLY

★

A Monthly Record of Veterinary Science
Devoted to the cause of the
Veterinary Profession

★

EDITOR

Rao Sahib T. VINAYAKA MUDALIAR, G.M.V.C.,
Office:—7, First Street, Vidyodaya East, T'Nagar,
Madras - 17, (S. India)

✱

All communications should be addressed to the Editor.

Advertisements should be in the hands of the Editor on or before the 1st of every month.

Subscription payable in advance { Rs. 8.00 per annum to Members of profession.
Rs. 12.00 per annum to Government and all public institutions. Single copy Rs. 2.00.
Foreign : 25sh. per annum. Single copy 3s. 6d.

Members who do not receive the Journal regularly or who find it wrongly addressed are requested to communicate their correct address in block letters to the Editor at once. Non-receipt of a particular issue should be intimated before the close of that month.

61
Regd. No. M. 6953

Vol. 38, No. 3

MARCH, 1961

THE INDIAN VETERINARY JOURNAL

(The Journal of the Indian Veterinary Association)

*A Monthly Record of
Veterinary Science*



(ESTD. 1924)

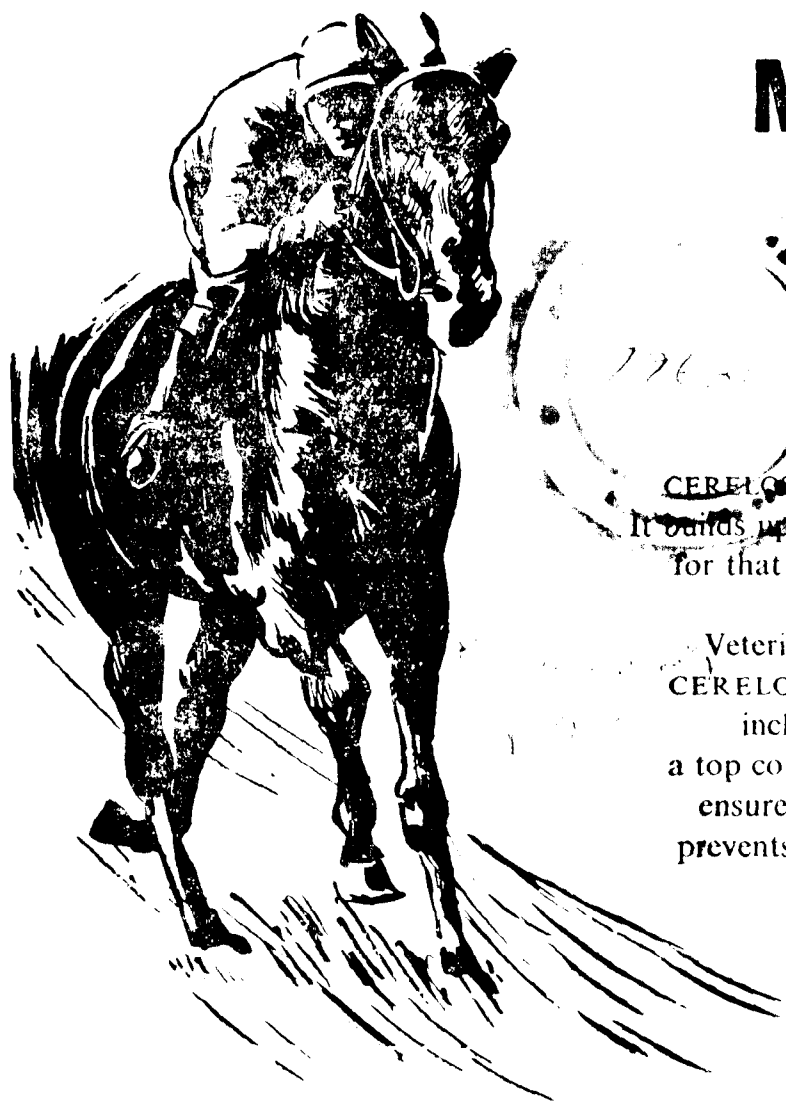
OFFICE:

7, FIRST STREET,
VIDYODAYA EAST, T'NAGAR,
MADRAS-17, (S. INDIA)

TEL. NO. 88743

ADVERTISEMENTS

CERELOSE 'H'



MAKES A WINNER

Owners and Trainers say

CERELOSE 'H' is ideal for horses. It builds up large reserves of energy for that extra spurt and stamina.

Veterinary experts recommend CERELOSE 'H' for all animals—including domestic pets—as a top conditioner which not only ensures physical fitness but also prevents out-of-season coat loss.

CORN PRODUCTS CO. (INDIA) PRIVATE LTD., BOMBAY-1

Agents for India : Parry & Co. Ltd.

When writing to advertisers, please mention *The Indian Veterinary Journal*.



ADVERTISEMENTS

PARACHLORGEL

granulated

Contains : Carboxymethylcellulose, Quarternary ammonium salts, Deodorants.

As lubricant in obstetrical work,
as replacement of amniotic fluid.

For internal use Parachlorgel is also very suitable as a mucous vehicle for medicaments in gastritis, enteritis and especially in chronic constipations of large intestines.

COVERING PASTE

BENGEN

Active ingredients : Oleum Jecoris Aselli, Zincum oxydatum.

Lubricates and protects arms,
hands and the operating areas
in obstetrical work.

CIRUGIA DE LUX PRIVATE LIMITED

CALCUTTA - 13

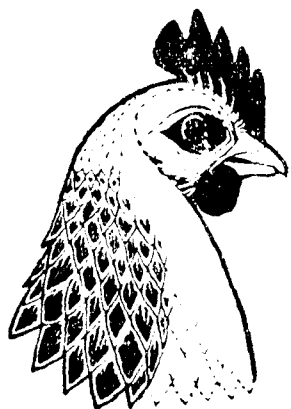
BOMBAY - 1

When writing to advertisers, please mention *The Indian Veterinary Journal*.

Introducing

NEFTIN

the modern answer to **PULLORUM DISEASE**



'Neftin' is the modern answer to Pullorum Disease because it kills the Salmonella germs which cause the infection.

The introduction of 'Neftin' in India provides you with a new and powerful means of combating Pullorum and other Salmonella infections.

It is used extensively in America and the U.K. in conjunction with blood-testing of adult stock, and in the treatment of young chicks exposed to infection.

PULLORUM OUTBREAKS CAUSE HEAVY LOSSES. WITH 'NEFTIN' YOU CAN PROTECT POULTRY FLOCKS SAFELY AND EFFECTIVELY.



'Neftin' is available in containers of 450 g. (1 lb.) and 3.2 kg. (7 lb.) from Pharmed Private Ltd., Bombay, Delhi, Calcutta, Madras.

SK & F LIFE-SAVING NITROFURANS

Advisory literature and further information are available on request from:

Smith Kline & French (India) Ltd.
(Incorporated in England with limited liability)
141, Fort Street, Bombay 1.

'Neftin' (trade mark) brand of furazolidone.
Ind. Pat. Nos. 56634/56

NF: PA30 Ind.

When writing to advertisers, please mention *The Indian Veterinary Journal*.



used by
leading
breeders
and
kennel
owners

'LOREXANE' DUSTING POWDER

To keep dogs free from ticks, lice, fleas and mites. Dust lightly on the body and between the paws once a week after grooming.

'LOREXANE' ANTISEPTIC CREAM

For the treatment of all wounds. One or two applications are sufficient to heal the wound and prevent maggot infestations.

'TETMOSOL' MEDICATED SOAP

The ideal dog soap to keep dogs free from ticks, lice, fleas and mange and encourage the growth of a healthy, glossy coat.

In severe mange, 'Tetmosol' Alcoholic Solution 25% diluted 1:10 in water, applied to the affected areas will effect a cure.

TETRACHLOROETHYLENE (Capsules)

For hookworm and other roundworm infestations.



IMPERIAL CHEMICAL INDUSTRIES (INDIA) PRIVATE LTD.
Calcutta Bombay Madras New Delhi

Sole Distributors in India for
IMPERIAL CHEMICAL INDUSTRIES LIMITED, PHARMACEUTICALS DIVISION
WILMSLOW, CHESHIRE, ENGLAND

ICV 838

When writing to advertisers, please mention *The Indian Veterinary Journal*.

The Indian Veterinary Journal

(The Journal of the Indian Veterinary Association)

Vol. 38

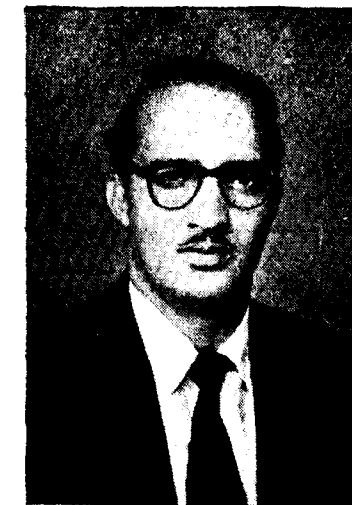
MARCH 1961

No. 3

CONTENTS

	PAGE
I. Editorial	
Opinions worth recording ...	E-5
II. General Articles	
Comparative medical studies of chronic degenerative diseases as a veterinary public health activity.—By Martin M. Kaplan ...	115
Histochemical distribution of Alkaline Phosphatase in some normal organs of goats.—By M. R. Dhanda, G. L. Sharma and R. C. Bhalla ...	122
Nutritive value of groundnut (<i>Arachis Hypogaea</i>) Bhoosa.—By V. Mahadevan, M. M. Jayal and P. S. Gupta ...	130
Vermineous Gastro-enteritis and its influence on weight response in sheep.—By C. K. Abdulla Khan ...	136
A check-list of the Helminth Parasites in the Department of Parasitology, Madras Veterinary College (Additions since 1954).—By V. S. Alwar and C. M. Lalitha ...	142
Chronic Diarrhoea in hill cattle.—By M. Kesavan ...	148
A practical method for capture and destruction of stray dogs in a town.—By K. B. Roy ...	150
III. Clinical Article	
Autogenous wart vaccine.—By S. R. Chandran ...	152
IV. Abstracts	
Most eggs in morning ...	155
Fertility and hatchability ...	155
Vitamin A and Coccidiosis ...	156
Age and Albumen quality ...	156
Critical tests of Hygromycin B as an Ascaricide of swine ...	156
A study of various approaches for Thoracotomy in canines ...	157
V. News and Views ...	157
VI. Correspondence ...	159
VII. Association News	
The Indian Veterinary Association—The I. V. J. Reserve Fund, List of contributors ...	160
The U. P. Veterinary Association—Proceedings of the Executive Committee meeting held on the 15th and 16th Jan. 1961 ...	162
VIII. Reviews	
Vibro fetus infection of cattle.—Edited by J. A. Laing ...	163
Nagpur Veterinary College Magazine, Vol. 1, Jan. 1961 ...	163

Goes Abroad



Sri IFTIKHAR MOHD. KHAN, B.V.Sc.,
Andhra Veterinary College, Tirupathi
 has proceeded to Georgia University U.S.A.
 for higher studies in Dairy Husbandry.



Dr. Ganti A. SASTRY,
G.M.V.C., B.V.Sc., M.Sc., M.S., Ph.D.,
Lecturer in Pathology,
Andhra Veterinary College, Tirupathi.



Dr. R. D. NANJIAH,
B.Sc., G.M.V.C., B.V.Sc., Ph.D.,
Principal,
Mysore Veterinary College, Bangalore.

[See News and Views]

THE
Indian Veterinary Journal
(The Journal of the Indian Veterinary Association)

Vol. 38

MARCH, 1961

No. 3

Editorial

OPINIONS WORTH RECORDING

It is highly refreshing to read in the pages of the *Veterinary Record* of London, the well balanced views of two our eminent Veterinarians, who have grown grey in the service of the world at large, on the subject of the suitability of Veterinarians for livestock improvement work. We make no apology for quoting them *in extenso*, for they reveal a highly knowledgeable and constructive approach to a subject, which in recent years has had the misfortune to gather around itself so much of ill-informed and undigested opinions, to the great detriment of the *rapid* development of livestock in this land.

In a leading article on the subject of "The Future of Animal Husbandry in Overseas Territories" in the *Veterinary Record* of 7th January 1961, Mr. Wm. C. Miller of Animal Health Trust, Equine Research Station, Newmarket, after a clear and convincing survey of the problem of food-supply so intimately connected with the Animal Husbandry work, deals with this complicated subject in a very interesting manner. Commencing with the 'livestock education' required, he touches on the subject of 'applied science' and finally points out how very necessary it is to consolidate and conserve the ground gained through proper control of devastating diseases. In effect, he indicates that the entire work is so well integrated that we cannot piece-meal it without serious risk to the continuity and efficiency of this highly nationalistic work. Here is what Mr. Miller says :—

" The Veterinary student to-day spends a minimum of 5 years training, concentrated entirely upon animal health and disease in all their aspects. There is no equivalent form of training for any other class of technical or



'STRINACIN'

for the control
of Enteritis

'Strinacin', a combination of three of the most active sulphonamides with streptomycin, is indicated in calf-scours, piglet enteritis and diarrhoea in all species of farm, and domestic animals.

'Strinacin' is supplied in containers of 20 x 5 G. tablets.



TRIPLE SULPHONAMIDE WITH
STREPTOMYCIN

Further information is available on request



MANUFACTURED BY
MAY & BAKER LTD

DISTRIBUTORS: MAY & BAKER (INDIA) PRIVATE LTD
BOMBAY • CALCUTTA • GAUHATI • MADRAS • NEW DELHI

An M&B brand of Veterinary Product

VA1026-238

When writing to advertisers, please mention *The Indian Veterinary Journal*.

General Articles

COMPARATIVE MEDICAL STUDIES OF CHRONIC DEGENERATIVE DISEASES AS A VETERINARY PUBLIC HEALTH ACTIVITY¹

By

MARTIN M. KAPLAN, V.M.D.,
Chief, Veterinary Public Health, WHO, Geneva.

Comparative medicine can be defined as the study by comparison and contrast of biological phenomena in health and disease in various animal species, including man. Such studies are not new, forming a part of ancient as well as modern medicine with respect to anatomy, physiology, pharmacology, etc., as well as to communicable and other diseases. Their incorporation as part of veterinary public health² activities, however, is a recent development in that they comprise a co-ordinated and directed application of comparative medical studies to major disease entities of man.

Chronic degenerative diseases are emerging as the most pressing medical problems of the present and future, consequent upon the steady subjugation of acute communicable diseases now in the course of accomplishment in most parts of the world. Comparative medical studies of acute communicable diseases, and of infectious agents in general, retain a high level of importance to public health, but consideration here will be limited only to the principal chronic degenerative diseases (some of which may have a communicable aspect), notably cancer and cardiovascular diseases. Other chronic conditions such as muscle, bone, joint and metabolic disorders will be touched upon only briefly.

For the purposes in question a distinction must be drawn between experimentally induced diseases of the chronic degenerative type in animals, and those conditions which occur spontaneously. A vast amount of work and attention is understandably being given to experimentally produced diseases, especially in laboratory animals, and the pragmatic results obtained fully justify such an approach so that its

1. Presented at the WHO/FAO/CCTA Seminar on Veterinary Public Health, Nairobi, Kenya, 24 November-3 December 1960.

2. Veterinary public health has been defined as "the field of activity which protects and advances human well-being by utilizing the combined knowledge and resources of all those concerned with human and animal health and their inter-relationships." (WHO Tech. Rep. Ser. 111, 1956).

professional officer. Agricultural students with normally either 3 or 4 years of academic training, must study a large range of disciplines other than those concerning animals. The time spent in studying soil chemistry, crop husbandry, marketing, farm economics, and so on, leaves time for only a superficial study of livestock production. No training is or can be given to them in the complicated problems of modern disease control in tropical territories. Agriculturists cannot logically be expected to assume responsibilities for animal production, abattoir organisation and the processing of animal products for human consumption, under conditions where the great livestock plagues and a multitude of lesser ones are a constant menace.

It is only too well known that in the past, full use has seldom been made of the potentials of the veterinary staffs in many overseas territories, and time and again mistakes and failures have occurred because of the delegation of livestock development or improvement schemes to those with inadequate knowledge and training. Many of these schemes have been rescued from complete ruin at heavy ultimate cost to the taxpayer, and details have been hushed up or dealt with in a perfunctory manner.

It is certainly not too much to claim that such utter fiascos as the Gambia Poultry Development Scheme or the Tanganyika Groundnuts Plan, to mention only two, now fading into the limbo of memories and past history, would never have failed if full veterinary considerations had been given the weight they deserved."

Offering his remarks on this important subject in the *Veterinary Record* of 14th January 1961, a savant of our profession who had spent a life-time in this country and whose uprightness and thorough knowledge of subjects are even to this day remembered by those who had served under him—We refer to Sir Frank Ware—has the following interesting remarks to make:—

"In my view the case for placing the overall direction of livestock improvement work, which is what animal husbandry means, under the unified control of a Veterinarian is an overwhelming one in the tropics. How can one expect livestock to prosper if their requirements are attended to by two or more departments, which are often at loggerheads? How can one expect a Veterinarian to carry out his duties efficiently if he is debarred from entering the field of nutrition in a country where the provision of a maintenance ration is often as important as finding a remedy for a contagious disease; or from giving advice on breeding problems in a country where the subject of controlled breeding is little understood and rarely practised? How can one expect an agriculturist to find time to give detailed study to the subject of livestock improvement when he has so many other irons to keep hot in the fire? And to the imposing list of such subjects given by Mr. Miller I would add agricultural engineering, which to-day is a major concern with all agriculturists!

I often think that we, as a profession are much to blame for the present unsatisfactory position of the Veterinarian in the sphere of Animal Husbandry in the tropics. In the past quite an appreciable percentage of veterinary graduates have been slow to put forward any claim to expertise in this subject and this, I believe, has been due to two reasons. Although, as Mr. Miller

points out, veterinary graduates are the best basic material from which to recruit animal husbandmen, the small amount of attention paid to this subject in our teaching institutions in the past has resulted in lack of confidence in our graduates. Again, the narrowness of the system of education in the past has provided graduates with an excuse for adopting the "closed shop" attitude and confining their attention strictly to purely veterinary problems, into which no non-veterinarian may enter.

We cannot have it both ways. If we wish to adopt the "closed shop" attitude then we must expect to see much interesting and rewarding work done by others; whereas if we broaden our horizon and open our doors to anyone interested in livestock improvement there will be competition in due course from non-veterinarians for some of the higher posts, including the ultimate head. May the best man win, but for the sake of smooth running may he be a veterinarian!"

We have recorded in these pages similar opinions of eminent scientists like Sir Thomas Dalling, Dr. Norman C. Wright and others. We appeal to all concerned to bestow enough thought over such weighty opinions.

A New Year Offer

The Silver Jubilee Number of the *Indian Veterinary Journal*, (July 1949) is offered to the Members of the profession and students at a concessional rate of Rs. 3/- (Reduced from Rs. 5/-) Postage extra. Only a limited number of copies are available. Hurry up to avoid disappointment! It contains the genesis and growth of (1) all the State Veterinary Departments in India and Pakistan; (2) all the Veterinary Colleges in India; (3) the Indian Army Remount and Veterinary Services; (4) the I.V.R.I., (5) the A.I.V.A., (6) the *Indian Veterinary Journal*, as well as highly complimentary messages from all over the world.

There are special professional articles by Dr. G. Lapage; Dr. J. O. L. King; Dr. S. Datta; Dr. M. R. Dhandu and Dr. V. R. Rajagopalan; Dr. S. G. Iyer and Dr. C. S. Balakrishnan and Dr. S. N. Yeravdekar.

It is a historical document of great value which ought to be in the Library of every Veterinarian.

LOOK SHARP!

LOOK SHARP!

Apply to the Editor I.V.J.

theoretical advantages and limitations need not be considered here. (It might be noted in passing, however, that certain of the common cardiovascular diseases of man are not at present experimentally reproducible in animals (*e.g.*, rheumatic fever), while experimentally induced diseases may not be duplicates of the human condition (*e.g.*, hypertension and atherosclerosis). Such experimental work will undoubtedly continue to receive considerable attention and support in the future. The particular and unique contribution of comparative medical studies as a part of veterinary public health activities is derived from the stimulation of research, collection and analysis of data on *spontaneous* disease processes in *domestic* animals (and to a lesser extent wildlife) referable to analogous diseases in man. The lines of division indicated above, *viz.*, spontaneous *versus* induced disease and domestic in distinction to laboratory animals, should not be treated too rigidly, because all possible areas of investigation must be entered if leads so indicate. The arbitrary demarcations are made in part for practical considerations, *i.e.*, the reasonable possibilities of accomplishment by veterinary public health workers. This does not lessen the obligation, however, of such workers to be fully aware of developments in related areas of scientific activity which may find application in investigations amenable to a comparative medical approach allied to veterinary public health work.

The rationale for comparative medical studies in a veterinary public health context may be summarized as follows :—

1. Spontaneous disease processes such as cancer and cardiovascular diseases are biological phenomena common to many species of animals, and it may be safely assumed that these conditions are broadly comparable to those observed in man.
2. Studies of these diseases in domestic animals lend themselves uniquely to epidemiological types of investigation. Thus environmental factors common to man may be segregated and studied from the standpoint of their possible influence on etiology.
3. A wealth of material is readily obtainable in abattoirs, veterinary clinics, and from the carefully kept records of animal groups (herds or flocks) of similar or contrasting genetic, age and nutritional backgrounds. The latter factors, amenable to study, may be operative in a particular disease process.
4. The life span of certain animals physiologically resembling man, *i.e.*, dog, telescopes that found in man reducing the period of time needed for study of age-associated components.
5. Species of animals differ in anatomical and physiological details which may result in individual expressions of similar disease

processes related to structural or functional variables distinguishing certain species. The existence of these variables, when combined with a detailed understanding of them may well shed light on the specific factors involved in certain disease conditions.

6. Finally (and obviously) animals can be experimented with more easily than man for the investigation of any leads of particular interest.

As mentioned previously, the two major problems confronting human medicine with respect to chronic diseases are cardiovascular disease and cancer, and WHO has been examining these fields from the point of view as to how research in animals might be intensified on an international scale for possible light such research may shed on analogous human problems. These diseases are considered briefly below, followed by a short reference to other chronic degenerative conditions.

A. Cardiovascular Diseases

While there is a large amount of scattered knowledge of cardiovascular disease conditions in different animals, a systematization of this knowledge is lacking and the use of epidemiological techniques to analyse environmental and other influences has been rarely applied.

The possibilities have been surveyed by WHO scientific advisory groups for undertaking and co-ordinating comparative cardiovascular studies pertinent to major human problems in this field. WHO has sought to determine where its unique co-ordinating function may be most profitably applied, and is focussing attention on a few specific problems which it might undertake to investigate, keeping in mind practical limitations of specialists and funds now available. At the same time, it hopes to stimulate long-term studies through collaborating centres and by fostering the training of a few specialists so that baseline data might be assembled over the course of the next few years.

Particular attention will be given to (1) pilot surveys of naturally occurring atherosclerosis in swine, cattle, sheep, poultry and wild birds ; (2) the examination of hearts from wild and domestic animals in Uganda to determine if a cardiomyopathy common to man in that area occurs also in animals ; and (3) a "prospective" study in a dog colony (beagles) where several hundred dogs would be followed very carefully through their entire lives for the development of spontaneous cardiovascular disease. This study would be incorporated into observations on these dogs now being held for other purposes.

There are many analogous cardiovascular conditions in man and animals which deserve study. For example, with reference to the questions of arterial hypertension and pulmonary heart disease, it would be

163
116
47

of interest to study more closely the phenomenon of natural high blood pressure found in giraffes and turkeys. Also, the so-called "brisket disease" found in cattle living in high altitudes is no doubt comparable to high altitude disease in man.

The following are some cardiovascular diseases and clinical syndromes noted in animals* which may be considered analogues of certain human conditions:

1. *Idiopathic pericarditis*: Pericarditis with effusion in dogs.
2. *Cardiomyopathies*: Fatal syncope (plotzliche Herztod) in swine.
Round heart disease in poultry.
3. *Valvular heart disease*: Chronic proliferative valvular fibrosis in dogs.
4. *Congenital heart disease*: Dogs, swine and calves for surgical research.
Dogs and swine for genetic research.
5. *Pulmonary heart disease*: Brisket disease in cattle.
Dirofilaria immitis infestation in dogs.
Heaves in horses.
Hypertrophy of the pulmonary muscular arteries in cats.
6. *Arterial hypertension*: Naturally occurring hypertensive disease in dogs.
Naturally occurring hypertensive disease in monkeys.
Physiological high arterial pressure in turkeys and giraffes.
7. *Congestive heart failure*: Naturally occurring congestive heart failure in dogs.
8. *Cardiac arrhythmias and conduction disturbances*: Naturally occurring atrial fibrillation in horses, cattle and dogs.
Physiological atrioventricular block in horses.
Naturally occurring Wolff-Parkinson-White syndrome in cattle and dogs.
Naturally occurring bundle branch block in dogs.

* I should like to acknowledge my indebtedness for the preparation of the following sections to Dr. E. Cotchin, Department of Pathology, Royal Veterinary College, London, UK, and to Dr. D. K. Detweiler, Director, Comparative Cardiovascular Studies Unit, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, USA, who served as WHO consultants in comparative oncology and comparative cardiovascular diseases, respectively.

B. Cancer

Neoplasms of domestic animals may be studied from the aspect of aetiology (*e.g.*, genetic, carcinogenic, endocrinological or viral causal agents), histopathogenesis, histopathology, biological behaviour, epidemiology and geographical distribution, and chemo- and radio-therapy.

Species differences:

The most immediately striking feature of cancer in domestic animals is the difference in incidence and site of origin between the various species, and as compared with man.

Thus, tumours of some importance in the *horse* include melanomas of the skin, carcinoma of the glans penis, teratoma of the testis, squamous-cell carcinoma of the eyelid and of the cardiac portion of the stomach, and carcinoma of the nasal cavities and sinuses.

A common malignant neoplasm of the *ox* is lymphosarcoma (lymphatic leukosis), and others of importance include squamous-cell carcinoma of the conjunctiva, which is particularly encountered in the United States; on the other hand, cancer of the mammary gland of the cow is very rare.

Neoplasms appear to be rare in *sheep*, which are largely slaughtered young, but two of importance amongst these rare tumours are liver-cell tumours (unrelated to fluke disease or to cirrhosis), and more or less generalised lymphosarcoma.

In the *pig*, which is also largely slaughtered when young, tumours are rarely seen. The commonest tumour appears to be more or less generalised lymphosarcoma, while embryonal nephromas also occur.

In the *dog*, in London, the most important and common cancers are cutaneous melanomas, malignant tumours of the mammary gland, carcinoma of the tonsillar epithelium, intestinal lymphosarcoma and lymphatic leukosis.

In the *cat* similarly they are squamous-cell carcinoma of the tongue and the oesophagus, carcinoma of the mammary gland, sarcoma of bone and visceral lymphosarcoma.

In the *fowl*, the predominant neoplastic process is leukosis in its various forms.

It will be seen that some tumours are important in both man and domestic animals, while some are of importance in one, and of little or no importance in the other. The significance of these differences need study.

These differences in incidence and site may extend to breed and sex within a species; thus, limb bone sarcomas are largely restricted to the large breeds of dog, and upper alimentary tract cancer in cats is almost entirely a disease of castrated males.

In considering a possible explanation of these variations in incidence, it is stressed that in this field, as in that of cardiovascular and other diseases, there is a need for a systematic summary of available knowledge of species differences of an anatomical, histological, physiological, biochemical or biological nature, as these must influence any interpretation of observed differences.

These factors might underlie differences in (a) aetiology (e.g. susceptibility to carcinogenic action, perhaps due to differences in metabolic rate and metabolic pathways), (b) histogenesis (e.g. of melanomas in man and dog), (c) clinical course and malignancy (c.f. seminoma in man and dog—only rarely metastasising in dogs). However, many of the species differences in incidence of tumours may be due to such factors as different mode of life (e.g. herbivorous or carnivorous, more or less close association with man, town or country habitat, etc.), and perhaps especially by age of death or slaughter.

A study of aging processes and of neoplastic disease in animals, which are normally slaughtered for food when young, but would be allowed to live out their life-span, should be encouraged. This could be done, for example, in the case of cattle in India.

At the moment, there are a number of examples of tumours of domestic animals that appear to be ripe for more intensive study, from one or more angles (e.g. aetiology, histopathology, etc.), but it is to be expected that further study in parts of the world that are at present largely unknown in respect of animal tumours might well reveal others that would also be rewarding subjects.

The general course of events will probably be that broad surveys in certain countries or areas will reveal or confirm that certain tumours there are of particular or even unique importance. These special tumours will then be more intensively studied as spontaneous tumours, and from this study indications will arise of certain experimental investigations that would seem likely to yield information of a specific or a general significance.

The fact that certain tumours of man are of little or no significance in domestic animals also provides an opportunity for investigation: to account, for example, for the rarity of mammary cancer in cattle, of prostatic cancer in dogs, of gastric cancer and lung cancer in all species, of uterine cancer in bitches (which are prone to endometrial hyperplasia), and so on. It is clear that man is probably

just as special a case as any of the species of domestic animals in the pattern of incidence of his common tumours.

Tumours that might repay special study now:—

1. Lymphosarcoma and allied conditions (leukemias) in all species.
2. Carcinoma of bladder in cattle in certain areas of abnormally high incidence (e.g. Turkey).
3. "Cancer eye" and "horn core" cancer of cattle.
4. Melanomas of horse, ox and dog.
5. Alimentary and lung tumours of dogs and cats, e.g. geographic distribution of lung tumours; carcinoma of tonsil of the dog, and mouth, tongue and oesophagus of cat, with particular reference to atmospheric pollution.
6. Testis tumours, bone sarcomas, transmissible venereal tumour, mammary neoplasms and mast cell tumours of the dog.
7. "Jaagsziete" of sheep.

C. Muscle, bone, joint and metabolic diseases

Information on this group of diseases is scattered among various specialities. Listed below are some diseases of interest in domestic animals where study should be fruitful as regards disease problems in man.

1. Inherited-congenital hypoplasia of the hip in dogs.
2. Osteoarthritis in cattle and horses.
3. Degeneration of intervertebral discs in dogs.
4. Hemophilic arthropathy in dogs.
5. Pulmonary hypertrophic osteoarthropathy in dogs.
6. Avian nephritis and visceral gout.
7. Bacterial arthritides in livestock (e.g. swine erysipelas).
8. Tenosynovitis and transmissible synovitis of poultry.
9. Rheumatoid arthritis in swine.
10. Skeletal and articular involvement in brucellosis.
11. Various myopathies in livestock.
12. Diabetes and other endocrine disorders.

It is apparent that the implementation of the outlined activities given previously constitutes a long and difficult task. The challenge, however, must be met head on, with the conviction that a concerted and sustained effort will undoubtedly be eminently worthwhile in terms of adding to our understanding and eventual amelioration of the ravages caused by those premature killers and maimers of man, the chronic degenerative diseases.

HISTOCHEMICAL DISTRIBUTION OF ALKALINE PHOSPHATASE IN SOME NORMAL ORGANS OF GOATS

By

M. R. DHANDA*, G. L. SHARMA, and R. C. BHALLA**,
*Division of Pathology and Bacteriology, Indian Veterinary Research
 Institute, Mukteswar—Kumaon, U. P.*

Introduction

Since Gomori (1939) and Takamatsu (1939) described the histochemical method for the detection of alkaline phosphatase in tissue sections, much work has been carried out in regard to the distribution of this enzyme in different organs in health as well as in diseased conditions.

In a separate investigation in respect of histochemical and histopathological changes in foot-and-mouth disease infected goats, study regarding the changes, if any, in the distribution of alkaline phosphatase in the experimentally infected animals called for the study of the normal distribution of this enzyme. The present study, the results of which are given in this paper was, therefore, taken up since reference to the available literature showed that no work had been reported regarding the distribution of alkaline phosphomonoesterase in the different organs of healthy goats. Gomori (1941), Kabat (1941) and Bourne (1943) have described the distribution of this enzyme in various normal tissues of man and experimental animals.

Materials and Methods

Three healthy female goats 1 to 2 years in age, were killed and the specimens of different organs were collected for the study within half an hour of their death. The following procedure was adopted to keep the cytological picture of the tissue, to maintain the localisation of the enzyme at its site of activity and to minimize the destruction of the enzyme.

Thin pieces of tissue from 3-5 m.m. in thickness were fixed in chilled absolute acetone. Adjacent pieces of the organs were also fixed in 10% buffered formalin for the histological examination. The tissues fixed in acetone were kept at a temperature of -5°C for 20 to 22 hours,

with two subsequent changes of absolute fresh acetone for one hour each. One change of absolute alcohol and two changes of ethanol and ether mixture (equal parts) for 45 minutes each were then given. The tissues were transferred to 1% collodion for half an hour, were hardened in chloroform and were cleared in benzene. Paraffin blocks were prepared after the tissues had four changes of half an hour each in paraffin wax with a melting point of 56°C . Sections, 4 to 6 μ in thickness were cut and the paraffin ribbon was floated on water kept at 35 to 40°C temperature and the sections were taken on the albuminised slides, which were dried at 37°C for twelve hours.

Gomori's method, as advocated by Pearse (1954) was employed for staining of alkaline phosphatase. The slides were incubated in the substrate containing sodium B glycerophosphate for two hours. Brownish black or black stain, which is believed to be localized in the immediate vicinity of the enzyme was taken as a positive reaction.

One section from the acetone fixed tissues and one from the formalin fixed tissue were stained by the Hæmatoxylin and Eosin method.

Control Sections

The distribution of the positively reacting material was checked by comparing with an another section incubated in distilled water, instead of the substrate, the remaining process being the same.

Results

The Hæmatoxylin and Eosin stained sections showed absence of any histopathological changes in the corresponding section of the different organs stained for alkaline phosphatase, distribution of which is given below.

Kidney

In the cortical portion the brush border of the proximal convoluted tubule showed intense staining reaction (Fig. 1). The nuclei of the proximal convoluted tubule showed distinct alkaline phosphatase activity, while the cytoplasm looked granular and had dirty brownish colour. The alkaline phosphatase activity was also detected in the other portions of tubule proximal to the distal convoluted tubule. The nuclei of these cells exhibited some phosphatase activity, in the nuclear membrane and sometimes the chromatin material showed a mild reaction. The intensity, however, was less as compared to that in the proximal convoluted tubule. It was interesting to note that the portion of the tubules in the medullary portion and the medullary rays in the cortex were completely negative and thus the alkaline phosphatase reaction brought about a sharp distinction between the medulla

* Present Address: Shri M. R. Dhanda, Dean of the College of Veterinary Science, U. P. Agricultural University, P. O., Pant Nagar, Distt Nainital.

** Present Address: Shri R. C. Balla, Assistant Professor, Department of Anatomy and Histology, College of Veterinary Science, U. P. Agricultural University, P. O. Pant Nagar, Distt, Nainital.

and the cortex of Kidney. The cells lining the Bowman's capsule showed mild but distinct phosphatase activity. The degenerated cells, wherever present, in the proximal convoluted tubules revealed moderate staining reaction. The fibrous capsule lining the kidney was negative in reaction. Superficial cells of the capsule, however, in certain areas showed alkaline phosphatase activity.

The cells lining the lumen of papilla showed an intense staining reaction, and the nuclei of these cells had stained prominently (Fig. 2). The tunic of the blood vessels and also the endothelial cells lining these were negative in reaction.

Liver

In the normal liver of the goat the alkaline phosphatase activity was more pronounced near the periportal areas. The bile capillaries in this area stained prominently and they were outlined as black lines extending in between the cords of the liver parenchyma. The bile capillaries on either side of the parenchymatous cords were at certain places joined by smaller capillaries thus encircling the cell; the lumen of such smaller capillaries and those of the larger capillaries could be appreciated at certain places.

The nuclei of the parenchymatous cells stained moderately and the nuclear membrane could be well appreciated. The cytoplasm of most of the parenchymatous cells stained greyish brown. At certain places the cells lining the sinusoids had stained distinctly and more so in the periportal area. The staining of the parenchymatous cells and also the bile capillaries was moderately reduced towards the periphery of the lobule. The staining behaviour of the endothelial cells of blood capillaries revealed a very striking activity. In some of the capillaries the endothelial cells were showing a moderate activity of the enzyme while at other places these were completely negative.

Ovary

The unruptured graffian follicles showed marked phosphatase activity of the round or spindle shaped cells of theca interna and the enzymic activity gradually decreased peripherally with the result that the cells of periphery of theca externa were completely negative (Fig. 3). In some of the follicles the zone of enzymic activity was interspersed with negative foci. The activity in the ruptured follicles, and in the young developing follicles was very much less marked. The cells of corona radiata showed dirty brown staining (Fig. 4). The enzymic activity was conspicuously absent from the cells of membrana granulosa.

The oval or spindle shaped theca lutein cells of the corpus luteum showed marked phosphatase activity. The young proliferating connective tissue cells usually stellate in appearance also showed

evidence of enzymic activity. The endothelial cells in respect of arterial vessels in corpus luteum were positive for the activity of the enzyme in contrast to the negative reaction of the cellular elements of their walls.

The infundibulum of the fallopian tube adjacent to the ovary showed marked enzymic activity of the basement membrane of the epithelial cells as also of some of the underlying cells of the stroma. The endothelial cells of the capillaries of the stroma also reacted positively for the enzymic activity.

Tongue

The epithelial cells of the stratified squamous epithelium were negative except that the basal cells in between the two papillae of the connective tissue core showed strongly positive reaction. At these places the activity gradually decreased towards the stratum corneum. The adjacent epithelial cells showed slight reaction of their nuclei in which the nucleoli were comparatively more prominent. The endothelial cells of the vessels in the papillae and in some of the cores showed positive reaction. Some of the areas of the stratum corneum and also the portions of the stratum corneum in respect of fungiform papillae showed strongly positive reaction. The stratum corneum in respect of the ventral surface was also positive. The submucous connective tissue and the tunica muscularis were negative in reaction, however, the nerve bundle cut in cross section in the tunica muscularis revealed a moderate quantity of the enzyme.

Rumen

The villi and the pillars of the rumen showed slight positive reaction of stratum corneum. In one of the animals, areas of distinctly positive reaction in deeper layers of the stratified squamous epithelium were present (Figs. 5 and 6).

The connective tissue of the lamina propria and the tunica muscularis did not reveal any staining character.

Intestine

The epithelial cells lining the small intestine showed an intense staining reaction, which at places was as strongly reacting as the proximal convoluted tubule of the kidney. The luminal portion of the epithelial cells were staining markedly. The nucleus also showed a prominent staining reaction. The cells lining the serous surface of the intestine exhibited a moderate activity of the enzyme, though the distribution of the enzyme was not uniform in this area. The endothelial cells of the vessels in the connective tissue revealed some activity of the enzyme.

Heart

The heart muscle and the pericardium were negative in reaction. The endocardium though mild in reaction was showing activity for phosphatase enzyme.

Pituitary

Well defined peripheral zone of the capsule all around its surface showed strongly positive reaction for phosphatase enzyme, whereas the bulk of the deeper portion of the capsule was negative or very mildly reacting. Comparison of the corresponding section stained by Haematoxylin and Eosin method showed that the strongly positive reacting zone of the capsule corresponded to the distribution of relatively immature fibrous tissue cells which had slightly oval nuclei as compared to the spindle shaped condensed nuclei of the negative or mildly reacting cells in the deeper parts of the capsule. The endothelial cells in the capsule were positive. In the pars distalis there were groups of epithelial cells which reacted mildly. Although, it was difficult to discern the exact nature of these epithelial cells in the section stained for the alkaline phosphatase but from their distribution, and their being fewer in number and larger in size it was possible that these were basophil cells of this portion of the pituitary.

Pancreas

No Phosphatase activity could be detected in the section of pancreas.

Thyroid

The epithelial cells lining the alveoli and the colloid material were negative for the enzyme activity. No positive reaction could be detected in the endothelial cells. A single layer of the flattened fibroblastic cells towards the periphery of the capsule revealed a moderate amount of the enzyme.

Adrenal

The epithelial cells lining the zona glomerulosa showed marked staining affinity which was uniform in distribution. The nuclei stood prominently. In one of the goats, the parenchymatous cells in the zona fasciculata and zona reticularis showed patchy positive staining reaction (Fig. 7). The medulla was completely negative. The capsular tissue adjacent to the zona glomerulosa was positive for the enzyme reaction, but the tissue towards the periphery was negative.

Testis

The section of the testis examined from one animal was showing the connective tissue coat with its cells flattened against the tubule

and the basement membrane lining the tubule was positive for the enzyme activity. The spermatogenic cells consisting of two to three layers of cells were showing moderate quantity of the enzyme. In these cells the nuclei were staining comparatively strongly.

Discussion

Recent years have seen the development of a great deal of research activity in the field of histochemistry, particularly in respect of alkaline phosphatase, so that much information is now available on the biological role of this important enzyme. Gomori (1941), Takamatsu (1943), and Kabat (1941) and Wilmer (1944) have shown, by histochemical means that alkaline phosphatase is located in the brush border of the convoluted tubules, the site of glucose reabsorption, and is also present in different portions of the ascending loop of Henle while the glomeruli, the organs of filtration and the distal tubules did not contain the enzyme.

The intense quantity of the enzyme in the proximal convoluted tubule of the kidney and also in the surface epithelium of the intestine has led many authors to consider that the enzyme may be associated in the resorption of glucose or fatty acids in these areas. Our findings of the distribution of the enzyme in the goats kidney are in conformity with the results reported by the quoted authors. The distinct activity of the enzyme in the epithelial cells lining the papilla of the goats kidney, observed in this study poses the question regarding the role of this enzyme at the particular part of the organ, the elucidation of which requires further work. The connective tissue is usually negative for the alkaline phosphatase activity. The presence of the enzyme in young connective tissue cells in the repair of wounds and cutaneous tissue burns has, however, been shown by Danielli (1943, 1945). The presence of the enzyme in the relatively young connective tissue cells of the superficial parts of the capsule of the pituitary was an interesting observation and is in support of the finding reported by Danielli (1943, 1945) regarding the enzymic activity in the young connective tissue cells of the healing wounds.

The moderate enzymic activity in the stratum corneum of the rumen and of the tongue, as also degenerating epithelial cells in the kidney puts forth the possibility of the absorption of this enzyme from the blood by the degenerating epithelial cells.

The distinct enzymic activity in areas of stratified squamous epithelium of the villi and of the pillars of the rumen is yet another interesting observation. The fibrous food ingested by the ruminants undergoes soaking and fermentation by the abundant microflora and microfauna of the rumen. Gray (1947) indicated that 70 percent of the

cellulose digestion takes place in the rumen itself. That the absorption of lower fatty acids occurs from the rumen in sheep has been demonstrated by Barcroft (1944). In this connection Elsdon (1946) found that as compared to the other parts of the alimentary tract, the maximum concentration of these acids, the end products of carbohydrate digestion, was in the rumen and reticulum. The occurrence of alkaline phosphatase in the stratified squamous epithelium lining the rumen puts forth the probable role that the enzyme may be playing in the absorption of the end products of the cellulose digestion in the rumen.

The reason for some of the endothelial cells to be positive and the other completely negative in reaction in the same organ is obscure at this stage but it needs further investigation and as such a study in this regard may give useful clues in respect of the function of endothelial cells. The occurrence of the positively reacting areas in the zona reticularis and zona fasciculata in the adrenal has also been observed.

Our results regarding the distribution of the alkaline phosphatase in different organs of goat agree with the findings made in other animals by Bourne (1943), Gomory (1941) and Kabat (1941) with some differences mentioned in the text.

Summary

The distribution of the alkaline phosphatase in different organs of the healthy goats has been studied. The histochemical reaction showed the large amounts of the enzyme in cortical portion of the kidney, the epithelium lining the intestine and the round or spindle shaped cells of theca interna of the graffian follicles of the ovary. Areas of the phosphatase activity in the stratified squamous epithelium lining the villi and the pillars of the rumen were observed and their probable role discussed. In addition, small or moderate amounts of phosphatase were present in the endothelial cells of some of the organs. The peculiar behaviour of these cells in respect to their staining activity was observed. The bile capillaries especially in the periportal areas in liver, the young connective tissue cells towards the periphery of the capsule of the pituitary and groups of epithelial cells in this endocrine gland revealed moderate but distinct enzymic activity. The nerve bundle in the tunica muscularis of the tongue showed the staining reaction for the enzyme.

REFERENCES

- Bourne, G. (1943) ... *Quart. J. Exp. Physiol.*, **32**, 1.
 Barcroft, J. McAnally, R. A. ... *Journ. Exp. Biol.*, **20**, 120.
 and Phillipson, A. T. (1944)
 Elsdon, S. R. *et al* (1946) ... *Journ. Exp. Biol.*, **22**, 191.
 Danieli, J. F., Fell, H. B. and ... *Brit. J. Exptl. Path.*, **24**, 196.
 Kodicek, E. (1943)

Histochemical distribution of Alkaline Phosphatase in some normal organs of goats
 By M. R. DHANDA, G. L. SHARMA AND R. C. BHADLA



Fig. 2



Fig. 4



Fig. 1



Fig. 3

Histochemical distribution of Alkaline Phosphatase in some normal organs of goats

By M. R. DHANDA, G. L. SHARMA AND R. C. BHALLA



Fig. 6



Fig. 5



- Danielli, J. F. Fell, H. B. and ... *Brit. J. Exptl. Path.*, **26**, 367.
 Kodicek, E. (1945)
 Gomori, G. (1939) ... *Proc. Soc. Exp. Biol.*, N. Y., **42**, 23.
 Gomori, G. (1941) ... *J. Cell. Comp. Physiol.*, **17**, 71.
 Gray, F. V. (1947) ... *Journ. Exp. Biol.*, **24**, 15.
 Kabat, E. A. and Fruit, J. ... *Amer. J. Path.*, **17**, 303.
 (1941)
 Pearse, A. G. E. (1954) ... *Histochemistry, Theoretical and Applied*, London, J. & A. Churchill.
 Takamatsu, H. (1939) ... *Trans. Soc. Path. Japan*, **29**, 429.
 Wilmer, H. A. (1944) ... *Arch. Path.*, **37**, 227.

LEGENDS

- Fig. 1* ... Section of the kidney showing marked staining for alkaline phosphatase in the brush border of the proximal convoluted tubule; the other portions of the tubule exhibit only mild enzymic activity in their nuclei. Gomori's method of staining. X 280.
Fig. 2 ... Section of the kidney showing reaction for the enzyme in the papillary epithelium. The medullary portion is completely negative for the enzyme. Gomori's method of staining. X 65.
Fig. 3 ... Section of the ovary, the cells of the theca interna showing intense reaction with mild reaction of cells of theca externa. Gomori's method of staining. X 115.
Fig. 4 ... Same as No. 3 theca interna exhibiting foci negative for the enzyme. Cells in the corona radiata are negative. Gomori's method of staining. X 115.
Fig. 5 ... Section of the pillar of the rumen, positive reaction in areas of stratum lucidum and mild positive reaction of stratum corneum. Gomori's method and countered by Haemalum Eosin. X 65.
Fig. 6 ... Section of the villi of the rumen, same as above.
Fig. 7 ... Section of the adrenal showing negative reaction of the capsule, and of its blood vessel, intense and uniform reaction for the enzyme in zona glomerulosa. Irregular staining of the zona fasciculata, with prominently stained nuclei of its epithelial cells. Gomori's method of staining. X 65.

STANES MINERAL MIXTURE

Stanes Sterilised Fine Bonemeal for Cattle

The only Tonic at low price with high tonic value. Prevents diseases due to deficiency in CALCIUM and PHOSPHORUS. Largely used by all the Agricultural Research Stations in Madras, and by the Veterinary Departments.

Sold in bags of 14 lbs., 28 lbs., for supply in the Madras Presidency.

For further particulars apply to:—

T. STANES & CO., LTD.,
 COIMBATORE

NUTRITIVE VALUE OF GROUNDNUT (ARACHIS HYPOGAEA) BHOOSA

By

V. MAHADEVAN, M. M. JAYAL

and

P. S. GUPTA,

Animal Nutrition Division, Indian Veterinary Research Institute,
Izatnagar, U. P.

Groundnut is grown extensively in this country and is the major oilseed crop. The total production of groundnut in India was over 4.27 million tons in 1957-58 (Sarkar, 1960.) Assuming that the weight of *bhoosa* is half the weight of nuts, the quantity of groundnut *bhoosa* would be approximately 2.2 million tons. Local enquiries reveal that many farmers do not use it as a livestock feed but leave it in fields to rot and form manure. A better and profitable utilization could be effected by utilizing the entire produce as cattle feed. It was therefore, considered desirable to evaluate its nutritive value.

Experimental

Six *Haryana* male calves aged about one year and of an average body weight of 146 kg. were selected for the feeding trial. The groundnut *bhoosa* consisted mostly of leaves with a low percentage (20%) of stalks in it and it was offered *ad lib*. Half an ounce of common salt to each animal everyday and a free choice of water were given. As the phosphorus content in groundnut *bhoosa* was low (0.188%) it was decided to feed 20 gm. sodium di-hydrogen phosphate to three of the six calves with a view to assess if phosphorus supplementation increased its retention by the growing animals. The feeding regime extended over a period of 27 days the last seven days constituting the collection period. The residue left over by each animal during the metabolic period was collected separately, and analysed. The methods of analysis by A.O.A.C. were generally followed. The minerals, calcium and phosphorus were determined according to the modified methods by Talapatra, Ray and Sen (1940).

Results and Discussion

Chemical Composition : The percentage chemical composition of groundnut *bhoosa*, on dry basis, is detailed in Table I. For comparison the figures of gram (*Cicer arietinum*) straw, arhar (*Cajanus indicus*) husk, wheat (*Triticum vulgare*) bran and rice (*Oryza sativa*) bran (Sen, 1956) are also included.

TABLE I

Feeding stuff	Crude protein	Ether extract	Crude fibre	Nitrogen free-ext.	Ash	Calcium (Ca)	Phosphorus (P)
Groundnut <i>bhoosa</i>	15.013	2.877	27.587	43.771	10.752	1.680	0.188
Gram <i>bhoosa</i> or straw	6.010	0.530	14.450	35.700	13.310	—	—
Arhar husk	7.040	0.400	44.100	42.790	5.670	—	—
Wheat bran	11.390	1.730	16.620	60.360	9.900	0.18	0.870
Rice bran	10.200	12.980	14.690	39.850	22.080	—	—

The groundnut *bhoosa* on fresh basis contained 9.90% moisture and 0.5622 mg. carotene per 100 gm. of raw material.

Table I indicates that groundnut *bhoosa* is fairly rich in crude protein and calcium. The phosphorus content is, however, low which makes the Ca : P ratio in the diet quite wide, i.e. 8.94: 1.

TABLE II

Body weight of animals at short intervals.

Period in days from the start of the feeding experiment.	Animal Number						Average body weight kg.
	297	296	275	298	299	295	
	kg.	kg.	kg.	kg.	kg.	kg.	
1	132	130	180	132	132	170	146
7	136	134	183	135	135	174	149.5
14	141	138	187	139	139	178	153.66
20	146	140	191	143	143	182	157.50
27	150	143	194	146	147	186	161.06
Metabolic period							
Increase in body weight during the experimental period.	+18	+13	+14	+14	+15	+16	+15

Dry feed consumption from groundnut *bhoosa*.

TABLE III

Dry matter consumption per day.

Haryana calf No.	Liveweight before the metabolism trial.	Liveweight after the metabolism trial.	Average live weight during the metabolism trial.	Groundnut <i>bhoosa</i> consumed per day.	Feed consumption per 100-kg. live wt. per day.
	kg.	kg.	kg.	gm.	gm.
297	146	150	148.0	3849.10	2600.74
296	140	143	141.5	3984.18	2815.68
275	191	194	192.5	4238.45	2201.79
298	143	146	144.5	3819.89	2643.52
299	143	147	145.0	4029.81	2779.18
295	182	186	184.0	4831.57	2625.85
Average	157.5	161.06	159.25	4125.50	2611.13

The calves consumed, on an average, 2.61 kg. of groundnut *bhoosa* per 100 kg. live weight per day which is indicative of a fairly high palatability of the feed (Table III). During the experimental period of 27 days the calves recorded an average increase of 15 kg. in their body weight which shows a satisfactory rate of growth.

Digestibility coefficients

The digestibility coefficients of groundnut *bhoosa* are shown in Table IV.

TABLE IV
Digestibility coefficients.

Animal No.	Crude protein.	Ether extract.	Crude fibre.	Nitrogen-free-extract
298	63.72	34.52	48.42	59.76
299	56.24	35.72	51.53	58.71
295	59.64	39.27	47.16	65.01
297	52.40	40.05	53.95	65.87
296	58.55	34.61	58.30	58.32
275	59.73	41.31	54.65	66.74
Average	58.39	37.58	52.34	62.40

It will be seen from Table IV that for a dry roughage like groundnut *bhoosa*, the digestibility coefficients of crude protein, crude fibre and nitrogen-free extract are fairly high which have given it satisfactory values for digestible crude protein and total digestible nutrients (Table V).

Digestible nutrients of groundnut bhoosa

The digestible nutrients of groundnut *bhoosa* alone with those of some common dry feeds (Sen, *loc. cit.*) are given in Table V.

TABLE V

Feeding stuff	Digestible nutrients in kg. per 100 kg. dry material			
	Crude protein	Carbohydrates	Ether extract	Total
Groundnut <i>bhoosa</i>	8.77	41.75	1.08	52.95
Gram <i>bhoosa</i>	2.41	34.67	0.00	37.08
Rice straw (<i>aus</i>)	0.44	42.60	0.68	44.57
Wheat <i>bhoosa</i>	0.00	46.75	0.36	47.56
Wheat bran	8.72	59.10	1.14	70.39
Rice bran	6.76	35.15	10.00	64.40

TABLE VI
Nitrogen, Calcium and Phosphorus balances in gm. per day.

The Nitrogen balance is set out in Table VI, the Calcium and phosphorus balances are given in Table VII.

Hariana Calf No.	Offered in groundnut <i>bhoosa</i>	Left in residue	Consumed from groundnut <i>bhoosa</i>	Excretion		Balance
				Faeces	Urine	
			<i>Nitrogen balance</i>			
297	109.292	14.250	95.042	45.199	29.880	+ 20.013
296	109.292	11.504	97.788	40.582	35.163	+ 22.093
275	120.113	15.493	104.620	42.132	40.829	+ 21.659
298	109.292	14.844	94.448	34.266	34.363	+ 25.819
299	109.292	10.765	98.527	43.199	35.163	+ 20.165
295	123.128	6.494	116.634	47.382	39.439	+ 29.873
Average	113.402	12.225	101.177	42.110	35.796	+ 23.271

TABLE VII

Hariana Calf No.	Offered in groundnut bhoosa	Left in residue	Consumed from groundnut bhoosa	Consumed from sodium di-hydrogen phosphate	Total consumed	Excretion			Balance
						Faeces	Urine	Total	
Calcium balance									
297	72-892	9-105	63-787	—	—	52-328	0-566	52-894	+ 10-893
296	72-892	7-351	65-541	—	—	53-032	0-433	53-465	+ 12-076
275	80-109	9-899	70-210	—	—	57-917	0-733	58-650	+ 11-560
Average	75-298	8-785	66-513	—	—	54-426	0-577	55-003	+ 11-510
298	72-892	9-485	63-407	—	—	58-148	1-883	54-976	+ 8-481
299	72-892	6-758	66-184	—	—	56-922	0-983	57-855	+ 8-279
295	82-519	4-150	78-369	—	—	68-046	2-133	70-479	+ 7-690
Average	76-101	6-798	69-303	—	—	59-370	1-783	61-103	+ 8-200
Phosphorus balance									
297	8-554	1-311	7-243	3-974	11-217	6-610	0-090	6-700	+ 4-517
296	8-554	1-058	7-495	3-974	11-469	7-138	0-109	7-247	+ 4-222
275	9-401	1-425	7-976	3-974	11-950	7-052	0-083	7-135	+ 4-815
Average	8-886	1-265	7-571	3-974	11-545	6-933	0-094	7-027	+ 4-518
298	8-554	1-365	7-189	Nil	7-189	4-447	0-004	4-511	+ 2-078
299	8-554	0-973	7-581	Nil	7-581	5-023	0-071	5-094	+ 2-457
295	9-684	0-897	9-087	Nil	9-087	7-298	0-077	7-375	+ 1-712
Average	8-931	0-978	7-953	Nil	7-953	5-589	0-071	5-660	+ 2-293

From Table V, it is seen that groundnut *bhoosa* is fairly rich in digestible crude protein in which it excels cereal straws like rice straw and wheat *bhoosa*, is superior to gram *bhoosa* and comparable to wheat bran. The value of total digestible nutrients exceeds that of gram *bhoosa* and cereal straws but is definitely inferior to that of either wheat bran or rice bran. On the whole, groundnut *bhoosa* appears quite nutritious.

It will be observed from Tables VI and VII that all the experimental animals recorded positive retention for nitrogen, calcium and phosphorus. It is, however, of interest to note that three calves, which received phosphorus supplement through sodium di-hydrogen phosphate showed greater retention of both phosphorus and calcium. It goes to point out that supplementation of groundnut *bhoosa*, which is poor in phosphorus, with a phosphorus rich feed like cereal brans or phosphorus rich mineral mixture may be necessary for optimum calcium and phosphorus retention in growing calves.

Summary

The nutritive value of groundnut *bhoosa* has been determined.

Six Haryana calves were fed groundnut *bhoosa*, *ad. lib.* as sole feed. 3 of the 6 calves received in addition, 20 gm. sodium di-hydrogen phosphate. The calves relished the feed from the very start of the feeding experiment and consumed an average of 2.61 kg. of groundnut *bhoosa* on dry basis, per 100 kg. body weight per day. The percentages of digestible crude protein and total digestible nutrients were found to be 8.77 and 52.95 respectively. The calves receiving phosphorus supplement showed increased retention of both calcium and phosphorus.

Acknowledgment

The authors acknowledge their gratitude to Shri P.G. Pande, M.Sc., M. R. C. V. S. Director, I. V. R. I., for his interest in this work.

REFERENCES

1. Sarkar, S. C. (1960) ... Hindustan Year Book, M. C. Sarkar and Sons, Private Ltd., 14, Bankim Chatterjee Street, Calcutta.
2. Sen, K. C. (1956) ... Bull No. 25, I. C. A. R., Manager of Publications, Delhi.
3. Talapatra, S. K., Ray, S. C., and Sen, K. C. (1940) ... Ind. J. Vet. Sci. and Ani. Hus., 10, 243-258.

VERMINOUS GASTRO-ENTERITIS AND ITS INFLUENCE ON WEIGHT RESPONSE IN SHEEP

By

C. K. ABDULLA KHAN, B.Sc., G.M.V.C., B.V.Sc., D.V.P.H. (U.S.A.),
Disease Investigation Officer, Mysore Serum Institute, Hebbal,
Bangalore-6.

Verminous infestation constitutes an important factor vitally affecting the growth and development of sheep industry. Taylor (1953)¹ states "a very ordinary infestation of worms is sufficient to cause a loss of 20 to 30 lbs. of mutton per head". Spedding (1954)² has demonstrated significant depression in digestibility coefficient, appetite, live weight gain, wool production and carcass quality due to parasitic diseases. Herlick (1950)³ states that as much as 7 quarts of blood may be removed by stomach worms over a period of six weeks. The effect on wool production of mild infestation with *Trichostrongylus columbri-formis* has been shown by Carter *et al* (1946)⁴.

Swales⁵ (1930), Singer & Banker⁶ (1940), Shorb and Haberman⁷ (1940), Boddie *et al* (1941)⁸, Torop & Keith⁹ (1943) and several other groups of investigators have demonstrated phenothiazine to be effective against many of the nematode parasites of sheep as measured by criterion of faecal egg count. Controversial results regarding reduction in egg count or parasitic load and its indirect influence on body weight may be related to difference in degree of parasitic load or variation in dosage level of phenothiazine. Sixty six per-cent reduction in egg count in heavily infested sheep and 92% reduction in mild infestation has been recorded by Singer and Baker (1940).

While three 10 gm Phenothiazine tablets administered to moderately infested pasture fed lambs have failed to effect increased weight gains, an average increase of 7.5 lbs, amongst dosed over control during a two-month trial and a marked decrease in worm load with phenothiazine administered in liquid form at the rate of 0.25 gm. per pound body weight has been reported in the field trials of Robertson¹⁰ (1941). Allen and Oldfield¹ (1956) have recorded 10.5 lbs. increase in weight amongst treated lambs with two 25 gm. at two weeks interval. Whitten *et al*¹² (1953) have found an increase of 11.6 lbs. and 5.8 lbs. in body weight amongst sheep drenched at monthly intervals from weaning with phenothiazine and tobacco-infusion mixture respectively. In the field trials conducted by Krishna Rao⁶ (1953) under dry lot condition, the range of increase in weight of dosed over control is from 7.34 lbs. to 8 lbs. per head for mutton type of breed and 5.85 to 7.35 lbs. for woolly type with 7 to 12 doses given every two months depending upon the weight of the sheep.

Experimental Data:—While helminthic infestation is widely spread all over the sheep rearing tracts of Mysore State, the entire experiment was confined to within an area of 15 miles radius having exactly similar degree of rainfall, humidity, temperature and pasture condition, and possessing the same type of breed. It is a dry tract with 21.3 inches rainfall per year. Random faecal samples revealed a high percentage (75%) as positive for Strongyloid ova; and an approximately 30% mortality was attributed to verminous gastro-enteritis. Since the object of the experiment was to determine the difference in weight increase of medicated over control on contaminated pastures, no attempt was made to study the progressive sterilising effect of phenothiazine on verminous infestation. Nevertheless, random faecal samples from both treated and control groups were examined periodically to determine the persistence of infestation amongst control and absence of any "self cure" phenomenon. Grazing was the only source of nutrition and no concentrates were given at any stage. In selection of groups, particular attention was paid to the presence of animals of all age groups, so that the ultimate variation in weight of the entire flock under field condition could be determined. All animals under two months of age were not treated. Pregnant and those which became subsequently pregnant, even though medicated, were not taken into consideration for assessment of results due to rapid fluctuations of weights. Animals which were not produced for systematic dosing at regulated intervals, even though dosed, have been deleted from our data. Each animal was individually identified with a tattooed number. The dose used was 10 gms. for adult and 5 gms. for young sheep of 'Phenovis' brand of phenothiazine, administered in water dispersible form at two months intervals commencing from the month of June 1958.

Discussion

The differential value of anthelmintic treatment is directly related to changes in worm burden and hence to weather and climatic conditions. The development and longevity of larvae of different species react differently towards meteorological environment. Therefore, for "strategic" and "tactical" drenchings to be effective, seasonal variation in temperature, light, moisture and nature of parasitic fauna must be correlated. Such a study has not so far been undertaken in our State. From the epidemiological studies of parasitic diseases as made by Gordon (1948)¹ and widespread infestation of *Haemonchus contortus* and *Trichostrongylus* species in the State of Mysore, it may be presumed that the infestation builds up during the months of May and June, reaching its maximum during September and October when ideal conditions of heat and humidity prevail. Therefore, keeping in view the migratory habit of flocks, meteorological conditions, probable build-

up of parasitic fauna and need for economy, it was decided that four dosings in a year should be sufficient. These were distributed over 8 months, each dose being given every two months practically on the same date, commencing from June. The first dose was given with the object of eliminating the already existing worm load; the second dose with the object of expelling infection subsequently picked up during intensive grazing on luxuriant growth of contaminated pasture. The third was given to tide over the rainy season and the fourth at the commencement of dry season when grass is short and sparse, necessitating closer grazing over a larger area thus favouring heavier reinfestation. Besides, undernourishment may predispose animals to parasitic infestation through decreased resistance.

General group of investigation officers has established that survival, growth, development and performance of the host are markedly influenced by the degree of its parasitic load. Decrease in digestibility coefficient, appetite, live weight gain, wool production, emaciation, anaemia and even death are confirmed sequelae of verminous gastro-enteritis. Its economical significance becomes quite evident from the work of Priouzeau (1950)¹, who has estimated a loss of nearly 25 million francs in France alone. While economic loss resulting from helminthiasis has not so far been estimated in Mysore State, an appreciably high degree of mortality (approximately 30%) has been attributed to this cause alone. The high degree of efficiency of phenothiazine, its multiple anthelmintic action, its potential sterilising effect both on pasture and host are significant factors in control of nematode infestation. Taylor (1953)¹² states that "under conditions of farming on arable grounds, it may be possible through the use of phenothiazine together with folding system to free the flocks of worms altogether and to keep it free".

Certain controversial results reported regarding its anthelmintic action and indirect influence on increased live weight, carcass quality, and wool production may be related to the difference in degree of parasitic load, method of administration, dosage used, number of medications, age of the experimental hosts, type of breed, environmental conditions, nutritional standards, hygiene, and care and management. Most of the experiments so far conducted, both under laboratory and field conditions, are on lambs where the natural growth rate itself is quite appreciable. While best results in the weight gain are obtainable only amongst unmedicated lambs on comparatively parasite free pastures, significantly greater weight gains have been recorded with phenothiazine treated lambs on contaminated pasture as compared with unmedicated control.

In the field trials conducted by Krishna Rao (1953) no mention has been made of the different age groups of the experimental animals. The influence of the number of animals in a particular weight group is evident from the studies made at different centres. At Palvalli, the absence of any control in 20-30 lbs. weight group, presence of 17% in 30-40 lbs. group, and 25% in 40-50 lbs. group, respectively, markedly effected the total weight gains (184.2%) even with the 1st dosing, while a decrease in weight (-285.7%) is recorded at Rajvanthi where the proportion of control to dosed is reversed. Nevertheless with the progressive increase in number of dosing, the rapid increase in weight response in 40 to 50 lbs. and 50 and over groups at Rajvanthi offsets the initial heavy loss; and at the end of 3rd dosing the net loss in weight of dosed over control is only 2.1%. When the readings of dosed and control of Palvalli are combined with those from Rajvanthi the percentage increase so obtained (4.3 and 16.2%) for the 1st and 2nd dosings compare favourably with those of entire group (4.7% and 29%).

At Srinivasapur, where a good proportion is maintained in the number of controls over dosed in all the four groupings, it is observed that the net percentage increase of dosed over control compare favourably with the combined figures of Palvalli and Rajvanthi and with those of the entire flocks.

From the study of the weight increase in different groups, it is observed that the maximum response is obtained in the 30 to 40 lbs. and 40 to 50 lbs. group and that the response in 50 and above group is rather poor. Therefore, the total number of animals in these two groups markedly influence the net weight increase for entire flocks. This may perhaps be another reason for difference in weight response observed by different workers. In flocks where an approximate distribution of animals was in region of 25% in 20 to 30 lbs. group 30% in 30 to 40 lbs. group, 20% in 40 to 50 lbs. group and 25% in 50 and above group, the total increase in weight of dosed over control was 4.7%, 29%, 31% and 32.9% with 1st, 2nd, 3rd and 4th dosing respectively. The relationship of age to weight was 2 to 6 months for 20 to 30 lbs. groups, and 6 to 12 months for 30 to 40 lbs. groups. The weight for the corresponding ages of different breeds will naturally differ. It may be more convenient to read these percentage increases in relationship with age rather than weight groupings. The breed chosen for conducting these experiments was a woollen type. Marked difference in weight records may perhaps be observed with mutton type. Besides, the influence of hygiene, care, management, nutrition, meteorological factors, degree and nature of parasitic fauna, intercurrent infections, method of administration and particle size of phenothiazine may markedly determine the ultimate result. In the experiments the effect of nutrition

manifested itself immediately after the 4th dosing in the month of February. The on-set of draught condition resulted in slightly decrease in weight. From June to February, when the grazing facilities were good, a progressive increase in weight was observed in the first three groups. In spite of regular systematic dosing and good pasture conditions, the percentage weight gain in the last group was not very commendable due perhaps to the aged condition of the animals. Nevertheless, a progressive increase in weight was recorded when all the animals from the three different centres were grouped together and results assessed. Other factors being common and constant, these weight gains can only be attributed to indirect influence of phenothiazine on parastic fauna.

Percentage increase in weight of dosed over control.

Particulars	Dosed	Control	First dosing	Second dosing	Third dosing	Fourth dosing
<i>Pahalli:</i>						
20-30 lbs. group	43	11	181.2	159.1	xx	xx
30-40 lbs. group	10	—	—	—	—	—
40-50 lbs. group	5	1	7.2	60.3	xx	xx
750 lbs. group	9	3	58.8	160.0	xx	xx
	19	10	37.5	94.4	xx	xx
<i>Rajvanthi:</i>						
20-30 lbs. group	19	10	—285.0	—12.0	—2.1	xx
30-40 lbs. group	—	1	—	—	—	—
40-50 lbs. group	—	5	—	—	—	—
750 lbs. group	5	2	23.5	34.2	25.6	xx
	14	2	20.0	22.0	16.6	xx
<i>Srinivasapur:</i>						
20-30 lbs. group	66	37	13.2	29.0	31.0	32.9
30-40 lbs. group	10	6	22.9	31.4	37.7	26.3
40-50 lbs. group	13	9	5.9	31.1	76.5	61.8
750 lbs. group	23	11	10.4	32.7	61.3	59.7
	20	11	34.3	10.6	8.4	8.1
<i>All the centres combined:</i>						
20-30 lbs. group	128	61	4.7	29.0	31.0	32.0
30-40 lbs. group	20	7	5.3	10.1	32.0	26.0
40-50 lbs. group	18	15	17.9	33.4	75.1	61.8
750 lbs. group	37	16	10.7	45.0	55.4	57.3
	53	23	16.2	30.7	30.9	6.6

xx Not dosed.

Summary

A study has been made on the influence of phenothiazine dosing on weight response amongst sheep, infected with helminths and kept on contaminated pastures. Weight response in different weight groups and the relationship of the number of animals in each weight group to the ultimate increase or decrease in weight has been discussed.

Acknowledgment

The author is indebted to Dr. K. S. Shetty, Director of Animal Husbandry and Veterinary Services in Mysore, Bangalore, and Shri

G. A. Hardikar, Deputy Director (A.H.), Mysore Serum Institute, Hebbal, Bangalore, for their interest and guidance, to Messrs. Imperial Chemical Industries (India) Private Ltd., who placed free supply of phenothiazine and technical personnel at the disposal of the author, and to Mr. Doddramiah, Statistician of Department of Animal Husbandry and Veterinary Services in Mysore.

REFERENCES

- Allen, P. H. and Oldfield, ... *Am. J. Vet. Res.* **17**, 243. J. E. (1956)
- Boddie, F. G., Corner, H. H., ... *Vet. Rec.*, **53**, 170. Morgan, D. D. and Sloan, J. E. N. (1941)
- Carter, H. B., Franklin ... *J. Conn. Sci. Industr. Re. Aust.*, **19**, 46. M. C. and Gorden, H. Mch. (1946)
- Gorden, H. Mch. (1948) ... *Aust. Vet. J.*, **24**, 17.
- Herrick (1950) ... *J. Am. Vet. Med. Ass.*, **117**, 418.
- Krishna Rao, M. V. (1953) ... *Ind. Vet. J.*, **29**, 310.
- Priouzeau, M. (1950) ... *Rec. Med. Vet.*, **126**, 329.
- Robertson, D. (1941) ... *Vet. Rec.*, **53**, 47.
- Shorb, D. A. and Habermann, R. T. (1940) ... *Vet. Med.*, **35**, 454.
- Singer, A. J. and Baker, D. W. (1940) ... *Cornell Vet.*, **30**, 375.
- Spedding, C. R. W. (1954) ... *J. Comp. Path.*, **64**, 5.
- Swales, W. E. (1940) ... *Canadian J. Res.*, **18**, 266.
- Taylor (1953) ... *Vet. Rec.*, **65**, 629.
- Throp, W. T. S. and Kieth, T. B. (1943) ... *Vet. Med.*, **38**, 215.
- Whitten, L. K. and Macfarlane, I. M. (1953) ... *N. Z. Vet. J.*, **1**, 150.

Move Forward in Veterinary

MASTISIN

An oral treatment cures all forms of mastitis; increasing quality and quantity of milk. Also indicated in PASTEURELLOSIS, TRYPAELOSOMIASIS, NASAL SCHISTOSOMIASIS etc. Available in Cattle and Goat sizes, 2 lbs & 1 lb. packing, with an ointment. Price: Rs. 6.25 & Rs. 2.25 respectively.

For Free Samples Remit 50 nP. Stamp.

GANCERINA lbs 6 & PRANAVA lbs 3 (For External Dressing)

Is a full course for one animal, specially indicated with success in CANCEROUS HORN, Price Rs. 15.50. Rail route is cheaper for which give the nearest Rly. Station. Orders by Post must accompany 50% advance to cover Postage etc.

DEEBEE BROTHERS

1706, KHADIA JALOWALI NAKA, AHMEDABAD-1

A CHECK-LIST OF THE HELMINTH PARASITES IN THE
DEPARTMENT OF PARASITOLOGY, MADRAS
VETERINARY COLLEGE

(Additions since 1954)

By

V. S. ALWAR and C. M. LALITHA,
(Madras Veterinary College).

Since the publication of the check-list of parasites in 1954,* studies on the incidence of parasites in cats, ducks, pigeons, etc. in Madras were undertaken. Besides the helminths recorded for the first time in Madras in the above survey, new records from other hosts in this state as well as those received by the kind courtesy of workers from other states of this country and from foreign countries have also been included in this list.

- Phylum platyhelminthes Gegenbaur, 1859
Class Trematoda Rudolphi, 1858
Order Digenea v. Breden, 1858
Suborder Prostomata Odhner, 1905
- Family Dicrocoeliidae Odhner, 1910
Genus *Pancreatremia* Oschmarin, 1952
P. sp.
Host. Duck
Location. Pancreas
Locality. Madras (1959)
- Family Opisthorchiidae Luhe, 1901
Genus *Opisthorchis* Blanchard, 1895
O. obsequens Nicoll, 1914
Host. Duck
Location. Liver and gall-bladder
Locality. Madras (1958)
- O. sp.*
Host. Duck
Location. Liver and gall bladder
Locality. Madras (1959)
- O. tenuicollis* (Rudolphi, 1819) Stiles and Hassal, 1896
Host. cat
Location. Bile duct
Locality. Calcutta (1960)
- Mounted slides were spared by Dr. M. Chakravarty of Bengal Veterinary College.
- Genus *Metorchis* Looss, 1899
M. albidus (Braun, 1893)
Host dog
Location. Gall bladder
Locality. Mukteswar (1943)
- Family Heterophyidae Odhner, 1914
Genus *Heterophyes* Cobbold, 1866
- H. heterophyes* (v. Siebold, 1852) Stiles and Hassal, 1900
Host. cat
Location. Small intestine
Locality. Madras (1956)
- Family Fasciolidae Railliet, 1895
Genus *Fasciola* Linnaeus, 1758
F. hepatica Linnaeus, 1758
Host. Cow
Location. Bile ducts
Locality. Madras (1954)
- F. gigantica* Cobbold, 1855
Host. Sheep, cattle
Location. Lung, ruminal wall
Locality. Madras (1942, 1954)
- Genus *Fasciolopsis* Looss, 1899
F. buski (Lankester 1857) Stiles, 1901
Host. Pig
Location. Small intestine
Locality. Calcutta (1960)
- The specimens were spared by Dr. P. K. Sinha of Bengal Veterinary College.
- Family Echinostomidae Looss, 1902
Genus *Echinostoma* Rudolphi, 1809
E. revolutum (Frohlich, 1802) Looss, 1899
Host. Duck
Location. Large intestine
Locality. Madras (1958)
- Genus *Echinochasmus* Dietz, 1909
E. perfoliatus (v. Ratz, 1908) Dietz, 1910
Host Dog
Location. Intestine
Locality. Orissa — Bhubaneswar (1959)
- Mounted slides were spared by Dr. B. Patnaik, Veterinary Parasitologist, Cuttack.

*Ind. Vet. J., 31, 46.

Genus *Stephanoprora* Odhner, 1902
S. polycetus (Dietz, 1909) Beaver, 1937
Host. Experimental crow
Location. Intestine
Locality. U.S.A. (1939)

The mounted slide was obtained through the courtesy of Dr. Paul C. Beaver, Lawrence College, Appleton, Wisconsin, U.S.A.

Family Plagiurchiidae Luhe, 1901
Genus *Prosthogonimus* Luhe, 1899
P. cuneatus Rudolphi, 1809
Host. Duck
Location. Oviduct
Locality. Madras (1959)

P. skrjabini Zakhrow, 1920
Host. Duck
Location. Bursa fabricii
Locality. Madras (1959)

Family Psilostomidae Odhner, 1913
Genus *Psilochasmus* Luhe, 1909
P. sp.
Host. Duck
Location. Small intestine
Locality. Madras (1958)

Family Notocotylidae Luhe, 1909
Genus *Notocotylus* Diesing, 1839
N. attenuatus (Rudolphi, 1809)
Host. Duck
Location. Large intestine
Locality. Madras (1958)

Genus *Ogmocotyle* Skrjabin and Schulz, 1933
O. indica (Bhalerao, 1942) Ruiz, 1946
Host. Hill cattle
Location. Small intestine
Locality. Mukteswar (1958)

The specimens were spared by Dr. C. T. Peter of Kerala Veterinary College.

Family Cyclocoelidae Kossack, 1911
Genus *Tracheophilus* Skrjabin, 1913
T. cymbius (Diesing, 1850)
Host. Duck
Location. Trachea
Locality. Madras (1958)

Genus *Transcoelum* Witenberg, 1923
T. oculus (Kossack, 1911)
Host. Duck
Location. Infra-orbital sinus
Locality. Madras (1958)

Family Strigeidae Railliet, 1919
Genus *Cotylurus* Szidat, 1928
C. sp.
Host. Duck
Location. Large intestine
Locality. Madras (1958)

Genus *Pharyngostomum* Ciurea, 1922
P. cordatum (Diesing, 1850)
Host. Tiger
Location. Small intestine
Locality. Coorg (1942)

Family Schistosomatidae Looss, 1899
Genus *Schistosoma* Weinland, 1858
S. mansoni Sambon, 1907
Host. Experimental mice
Location. Mesenteric veins
Locality. Egypt (1955)

The specimens were got from Dr. Anne Gismann of Bilhazia Snail Control Section, Ministry of Public Health, Cairo, Egypt.

Genus *Trichobilharzia* Skrjabin and Zakhavov, 1920
T. rodhaini Fain, 1955
Host. Duck
Location. Nasal vein
Locality. Madras (1958)

Family Paramphistomatidae Fiscoeder, 1901
Genus *Paramphistomum* Fiscoeder, 1901.
P. cervi (Schrunk, 1790)
Host. Camel
Location. Rumen
Locality. Madras (1957)

Genus *Cotylophoron* Stiles and Goldberger, 1910
C. cotylophorum Fiscoeder, 1901
Host. Buck
Location. Rumen
Locality. Topslip — Coimbatore district (1959)

Genus *Olveria*, Thapar and Sinha, 1945
O. bosi Tandon, 1951
Host. Cattle
Location. Rumen
Locality. Izatnagar (1954)

The specimens were kindly spared by Dr. C. T. Peter of Kerala Veterinary College.

Genus *Gastrothylax* Poirier, 1883
G. crumenifer (Creplin 1847)
Host. Bison
Location. Rumen
Locality. Madras Zoo (1959)

Genus *Gastrodiscoides* Leiper, 1913
G. hominis (Lewis and McConnell, 1876)
Host. Pig
Location. Large intestine
Locality. Calcutta (1960)

The specimens were spared by Dr. P. K. Sinha of Bengal Veterinary College.

- Class Cestoda Rudolphi, 1808
Order Cyclophyllidea Braun, 1900
Family Anoplocephalidae Cholodkowsky, 1902.
Genus *Anoplocephala* Blanchard, 1848
A. magna (Abildgaard, 1789) Blanchard, 1848
Host. Horse
Location. Small intestine
Locality. Madras (1954)
Genus *Moniezia* Blanchard, 1891
M. expansa (Rudolphi, 1810) Blanchard, 1891
Host. Giraffe, Hippopotamus
Location. Small intestine
Locality. Madras Zoo (1956)
Genus *Stilesia* Railliet, 1893
S. globipunctata (Rivolta, 1874)
Host. Camel
Location. Small intestine
Locality. Madras (1957)
Family Davaineidae Fuhrmann, 1907
Genus *Raillietina* Fuhrmann, 1920
R. echinobothrida (Megnin, 1880)
Host. Peacock
Location. Small intestine
Locality. Madras Zoo (1954)
Family Dilepididae Fuhrmann, 1907
Genus *Dipylidium* Leuckart, 1863
D. catus Gulati, 1929
Host. Cat
Location. Small intestine
Locality. Madras (1957)
Family Hymenolepididae Railliet and Henry, 1809
Genus *Fimbriaria* Frohlich, 1802
F. fasciolaris (Pallas, 1781) Wolff, 1900
Host. Duck
Location. Small intestine
Locality. Madras (1958)
Genus *Hymenolepis* Weinland, 1858
H. (Weinlandia) gracilis (Zeder, 1803)
H. (Hymenolepis) anatina (Krabbe, 1869)
H. (Weinlandia) collaris (Batsch, 1786)
H. (Hymenolepis) echinocotyle (Fuhrmann, 1907)
H. (Weinlandia) megalops (Nitzsch, 1829)
Host. Duck
Location. Small intestine
Locality. Madras (1958)
Cystic (larval) stages of Taenidae
Cysticercus tenuicollis
Host. Deer
Location. Liver
Locality. Madras Zoo (1959)
Hydatid
Host. Giraffe
Location. Lung
Locality. Madras Zoo (1950)
Phylum Nematelminthes Vogt (Quoted by Carus, 1863)
Class Nematoda Rudolphi, 1808
Order Ascaroidea Railliet and Henry, 1915
Family Ascaridae, Baird, 1853
Genus *Contracaecum* Railliet and Henry, 1912
C. spiculigerum (Rudolphi, 1809)
Host. Kite
Location. Small intestine
Locality. Madras (1955)
Family Heterakidae Railliet and Henry, 1914
Genus *Heterakis* Dujardin, 1845
H. gallinae (Gmelin, 1790)
Host. Turkey, Duck, Peacock
Location. Caecum
Locality. Madras (1956, 1960)
H. spumosa Schneider, 1866
Host. Rat
Location. Caecum
Locality. Madras (1957)
H. isolonchi v. Linstow, 1906
Host. Chinese Golden pheasant
Location. Caecum
Locality. Madras Zoo (1955)
Genus *Spinicauda* Travassos, 1920
S. sp.
Host. Calotes
Location. Intestines
Locality. Madras (1931)
Genus *Pseudoaspidodera* Baylis and Daubney, 1922
P. pavonis Baylis and Daubney, 1922
Host. Peacock
Location. Caecum
Locality. Madras Zoo (1954)
Genus *Ascaridia* Dujardin, 1845
A. galli (Schrunk, 1788) Freeborn, 1923
Host. Peacock
Location. Small intestine
Locality. Madras Zoo (1960)
A. compar (Schrunk, 1790) Travassos, 1913
Host. Himalayan partridge
Location. Small intestine
Locality. Madras Zoo (1958)
S. brumpti (Lopez Neyra, 1922) Cram, 1926
Host. Turkey
Location. Caecum
Locality. Madras (1956)
Family Kathaniidae Travassos, 1918
Genus *Spironoura* Leidy, 1856
S. brevispiculata Baylis, 1935
Host. Frog
Location. Intestine
Locality. Madras, (1954)

- Family Oxyuridae Cobbold, 1864
Genus *Oxyuris* Rudolphi, 1803
O. equi (Schrunk, 1788) Rudolphi, 1803
Host. Zebra
Location. Large intestine
Locality. Madras Zoo (1958)
Genus *Entrobium* Leach, 1853
E. anthropopetheci (Geddoelst, 1916)
Host. Chimpanzee
Location. Large intestine
Locality. Madras Zoo (1959)
Genus *Syphacia* Seurat, 1916
S. sciuri Mirza and Singh, 1934
Host. Flying squirrel
Location. Large intestine
Locality. Madras Zoo (1954)
Family Rhabditidae Micoletzky, 1922
Genus *Strongyloides* Grassi, 1879
S. felis (Chandler, 1925)
Host. Cat
Location. Small intestine
Locality. Madras (1957)
S. avium Cram, 1929
Host. Duck
Location. Small intestine
Locality. Madras (1958)
Order Strongyloidea Weinland, 1858
Family Strongyliidae Baird, 1853
Genus *Oesophagostomum* Molin, 1861
O. apiostomum (Willach, 1892) Railliet and Henry, 1905
Host. Monkey
Location. Caecum
Locality. Pondichery (1954)
O. brevicandum Schwartz and Alicata, 1930
Host. Pig
Location. Large intestine
Locality. Madras (1954)
O. asperum Railliet and Henry, 1913
Host. Goat
Location. Large intestine
Locality. Madras (1947)
The specimens were spared by Dr. G. Balasubramanian of Madras Veterinary College.
Genus *Chabertia* Railliet and Henry, 1909
C. ovina (Gmelin, 1790)
Host. Sheep
Location. Large intestine
Locality. Madras (1959)
Genus *Syngamus* v. Siebold, 1836
S. auris Faust and Tang, 1934
Host. Cat
Location. Ear
Locality. Ceylon (1954)
The specimen kindly spared by Dr. P. Seneviratna, Faculty of Veterinary Science, University of Ceylon.
Family Ancylostomidae (Looss, 1905) Lane, 1917
Genus *Ancylostoma* (Dubini, 1843) Creplin, 1845
A. caninum Ercolani, 1859
Host. Cat, Polar bear, Lion
Location. Small intestine
Locality. Madras (1956), Madras Zoo (1959)
Genus *Uncinaria* Frolich, 1789
U. logespiculum Maplestone, 1931
Host. Pole-cat
Location. Small intestine
Locality. Ceylon (1959)
The specimen were got from Dr. P. Seneviratna, Faculty of Veterinary Science, University of Ceylon.
Family Diaphanocephalidae Travassos, 1919
Genus *Kalicephalus* Molin, 1861
K. willeyi v. Linstow, 1904
Host. Krait
Location. Intestine
Locality. Hosur Cattle Farm (1954)
Family Trichostrongylidae Leiper, 1912
Genus *Trichostrongylus* Looss, 1905
T. colubriformis (Giles 1892) Ransom, 1911
Host. Capachun
Location. Small intestine
Locality. Madras Zoo. (1956)
T. tenuis (Mehlis, 1846)
Host. Duck
Location. Small intestine
Locality. Madras (1959)
Genus *Ollulanus* Leuckart, 1865
O. tricuspis Leuckart, 1865
Host. Lion
Location. Stomach
Locality. Madras Zoo (1960)
Genus *Haemonchus* Cobbold, 1898
H. longistipes, Railliet and Henry, 1909
Host. Camel
Location. Abomasum
Locality. Madras (1957)
Genus *Paracooperia* Travassos, 1937
P. nodulosa (Schwartz, 1928)
Host. Buffalo
Location. Small intestine
Locality. Madras (1957)
Genus *Ostertagia* Ransom, 1907
O. mentulata Railliet and Henry, 1909
Host. Camel
Location. Abomasum
Locality. Madras (1957)

- Family Amidostomidae Baylis and Daubney, 1926
Genus *Amidostomum* Railliet and Henry, 1909
A. anseris (Zeder, 1800)
Host. Duck
Location. Gizzard
Locality. Madras (1958)
- Family Metastrongylidae Leiper, 1908
Genus *Vogeloides* Dougherty, 1952
V. ramanujacharii (Alwar, Lalitha and Seneviratna, 1958)
Host. Cat
Location. Lung
Locality. Madras (1958)
- Genus *Anafilarioides* Gericheter, 1949
A. rostratus Gericheter, 1949
Host. Cat
Location. Lung
Locality. Ceylon (1955)
- The specimen was kindly spared by Dr. P. Seneviratna of Faculty of Veterinary Science, University of Ceylon.
- Order. Spiruroidea Railliet and Henry, 1915.
- Family Spiruridae Oerley, 1885
Genus *Spirura* Blanchard, 1849
S. rypileurites (Deslongchamps 1824)
Host. Mongoose
Location. Stomach
Locality. Madras (1958)
- Genus *Cyllocospora* Vevers, 1922
C. subequalis Molin, (1806)
Host. Cat
Location. Stomach
Locality. Madras (1956)
- Genus *Gongylonema* Molin, 1857
G. pulchrum Molin, 1857
Host. Sheep
Location. Oesophagus
Locality. Coimbatore (1956)
- The specimens were kindly spared by Dr. S. Krishnaswamy, Professor of Animal Hygiene, Agriculture College, Coimbatore.
- Family Acuaridae Seurat, 1913
Genus *Echinuria* Soloviev, 1912
E. uncinata (Rudolphi, 1819)
Host. Duck
Location. Gizzard
Locality. Madras (1958)
- Genus *Acuaria* Bromser, 1811
A. (Dispharynx) spiralis (Molin, 1858) Railliet, Henry & Sisov, 1912
Host. Pigeon
Location. Oesophagus
Locality. Madras (1958)
- Genus *Cosmocephalus* Molin, 1858
C. sp.
Host. Crow
Location. Gizzard
Locality. Madras (1954)
- Family Tetrameridae Travassos, 1914
Genus *Tetrameres* Creplin, 1846
T. sp.
Host. Duck
Location. Proventriculus
Locality. Madras (1958)
- Family Rictulariidae Railliet, 1916
Genus *Rictularia* Froelich, 1802
R. calirensis Jaegerskiold, 1904
Host. Cat
Location. Small intestine
Locality. Madras (1954)
- Family Camallanidae Railliet and Henry, 1915
Genus *Camallanides* Baylis and Daubney, 1922
C. prashadi Baylis and Daubney, 1922
Host. Krait
Location. Small intestine
Locality. Hosur Cattle Farm (1954)
- Order Filarioidea Weinland, 1858
Family Filaridae (Cobbold, 1864) Claus, 1885
Genus *Elacophora* Railliet and Henry, 1912
E. poeli (Vryburg, 1897)
Host. Cattle
Location. Aorta
Locality. Thailand (1956)
- The specimens were got by the kind courtesy of Dr. T. Tansanguan of the Faculty of Veterinary Science, Bangkok, Thailand.
- Genus *Setaria* Viborg, 1795
S. cervi (Rudolphi, 1819) Baylis, 1936
Host. Goat
Location. Peritoneal cavity
Locality. Rishikesh (1957)
- S. digitata* (v. Linstow, 1906) Railliet and Henry, 1911
Host. Cattle
Location. Urinary bladder
Locality. Madras (1954)
- Genus *Stephen filaria* Ihle and Ihle-Landerberg, 1933
S. Zaheeri Singh, 1958
Host. Buffalo
Location. Skin of the ear
Locality. Hyderabad, Madras (1960)
- The specimens from Hyderabad were kindly spared by Dr. Zaheer Ahmed of Andhra Pradesh Animal Husbandry Department.

- Genus *Indofilaria* Alwar, Seneviratna and Gopal, 1959
I. pattabiramani Alwar, Seneviratna and Gopal, 1959
Host. Elephant
Location. Skin nodule and sub-cutis
Locality. Topslip-coimbatore Dt. (1959)
- Genus *Conspicuum* Pandit and Iyer, 1929
C. flavescens (Castellani and Willey, 1905)
Host. Calotes
Location. Mesentery
Locality. Ernakulam (1956)
- The specimens were spared by Dr. Ray of the Filaria Research Station, Ernakulam.
- Order. Trichinelloidea Hall, 1916
Family Trichuridae Railliet, 1915
Genus *Trichuris* Roederer, 1761
T. cynocephalus Khera, 1951
Host. Monkey
Location. Caecum
Locality. Madras, Salem, (1954)
- T. discolor* (v. Linstow, 1906) Ransom, 1911
Host. Sheep
Location. Caecum
Locality. Madras (1958)
- T. raoi* Alwar and Achuthan, 1960
Host. Camel
Location. Caecum
Locality. Madras (1960)
- T. ovis* Abildgaard, 1795
Host. Deer
Location. Caecum
Locality. Madras Zoo (1960)
- T. sp.*
Host. Mongoose
Location. Large intestine
Locality. Madras (1958)
- Genus *Capillaria* Zeder, 1800
C. anatis (Shrank, 1790)
Host. Duck
Location. Large intestine
Locality. Madras (1958)
- C. sp.*
Host. Duck
Location. Nostrils
Locality. Madras (1959)
- C. columbae* (Rudolphi, 1819) Travassos, 1915
Host. Pigeon
Location. Small intestine
Locality. Madras (1958)
- C. sp.*
Host. Cat
Location. Urinary bladder
Locality. Madras (1957)
- C. sp.*
Host. Fowl
Location. Small intestine
Locality. Madras-Tirunelveli (1957)
- The specimen was spared by Dr. Balasubramanian of the Madras Veterinary College.
- C. sp.*
Host. Mongoose
Location. Intestines
Locality. Madras (1958)
- C. longicollis* (Mehlis, 1831)
Host. Peacock
Location. Small intestine
Locality. Madras Zoo (1960)
- Order Dioctophymoidea Railliet, 1916
Family Dioctophymidae Railliet, 1916
Genus *Dioctophyme* Collet Meygret, 1802
D. renale (Goeze, 1782) Stiles, 1901
Host. Dog
Location. Kidney
Locality. Kashmir (1958)
- The specimen was kindly spared by Dr. C. T. Peter of Kerala Veterinary College.
- Class Acanthocephala Rudolphi, 1808
Order Gigantorhynchidea Southwell and Macfie, 1925
Family Gligacanthorhynchidae Southwell and Macfie, 1925
Genus *Macrocanthorhynchus* Travassos, 1917
M. hirudinaceus (Pallas, 1781)
Host. Pig
Location. Small intestine
Locality. Delhi (1959)
- The specimens were spared by Dr. Karamchand of Punjab Veterinary College, Hissar.
- Order Echinorhynchidea Southwell and Macfie, 1925
Family Centrorhynchidae Van Cleave, 1916
Genus *Centrorhynchus* Luhe, 1911
C. sp.
Host. Kite
Location. Small intestine
Locality. Madras (1932)
- Genus *Empodius* Travassos, 1916
E. sp.
Host. Fowl
Location. Small intestine
Locality. Madras (1929)
- Family Corynosomidae Southwell and Macfie, 1925
Genus *Polymorphus* Luhe, 1911
P. sp.

Host. Crow, partridge	Family Moniliformidae Van Cleave, 1924
Location. Small intestine and subcutis	Genus <i>Moniliformis</i> , Travassos, 1915
Locality. Madanapalli (1944), Madras (1948)	<i>M. sp.</i>
Genus <i>Plagiorhynchus</i> Lubc, 1911	Host. Cat
<i>P. sp.</i>	Location. Small intestine
Host. Kite	Locality. Madras (1930)
Location. Small intestine	<i>M. moniliformis</i> (Bremser, 1811)
Locality. Madras (1932)	Host. Rat
	Location. Small intestine
	Locality. Madras (1930)

CHRONIC DIARRHOEA IN HILL CATTLE

By

M. KESAVAN, B.V.Sc.,

Veterinary Assistant Surgeon, Mudis.

Chronic diarrhoea is one of the commonest conditions in the cattle of Anamalai Hills in Coimbatore district, Madras State.

Symptoms

In these hills (Anamalai) the monsoons start from May and last till about September. The main cultivation in this area is Tea and Coffee.

In most cases the diarrhoea starts off with the onset of the monsoon. In some cases they start immediately after calving, probably due to the lowering of general health. The animal loses condition very rapidly. The coat loses its usual glossy nature. The diarrhoea continues to be obstinate resembling John's disease. In some cases oedema develops in the dependent parts like the under surface of the lower jaw. The diarrhoea usually lasts for 3 to 4 months. The animal becomes extremely dehydrated, exhausted and dies.

Investigation

109 specimens - Dung - were collected from cows and bulls suffering from diarrhoea and submitted to the Principal, Madras Veterinary College for microscopical examination. The following are the results of the microscopical examination:—

Name of Species.	Numbers of Positive cases.
Strongyle Species	30
Amphistome Species	12
Ascaris Species	8
Fasciola Species	5
John's Disease	4
Trichuris Species	3
Coccidiosis	2
Moniezia	1
Total	65

Total number of specimens submitted	...	109
Positive cases reported	...	65
Negative cases reported	...	44

In three cases there were mixed infections. They are as follows:—

- Fasciola Sps. and Trichuris Sps.
- Amphistomes and Trichuris Sps.
- Amphistomes, Strongyle and Trichuris Sps.

Treatment

Strongyles:—Such of those that were positive for Strongyles were treated with "Phenovis".

Dose	...	Adults	...	1½ ounces
		Calves	...	1 ounce

For very debilitated animals the full dose was divided into 2 or 4 parts and each part administered daily for 2 or 4 days as the case may be.

The diarrhoea in all the 30 cases ceased completely within 7 days. All the treated animals put on flesh and gained in weight. The deworming was followed up by administration of Liquor Arsenicalis for 7 days at the rate of ½ ounce daily for adults and ¼ ounce daily for calves.

Amphistomiasis and Fascioliasis:—These animals were treated with Hexachlorethane at the following rates:—

6 month old calves	...	10 gms.
1 year old	...	20 gms.
1½ years and above	...	30-40 gms.

The diarrhoea in this case also eased within 7 days. Out of 12 cases, one calf was very badly debilitated and it died. 11 cases responded favourably. The condition of the animals improved very much after the treatment. The treatment was followed by administration of Liquor Arsenicalis for 1 week.

In cases where the dung was negative, more specimens of dung, rectal-pinch and rectal wash in normal saline were submitted to the Principal, Madras Veterinary College. In 4 cases they were reported positive for Acid fast bacilli indistinguishable from *Mycobacterium paratuberculosis*.

Coccidiosis:—In these cases there were invariably blood and mucus present in the dung. They were successfully treated with the following:—

Sulpha Mezathine
Thymol
Creta

Ascariasis:—These cases were given:—

Ol. Chinapodium	...	1 to 4 drams.
Ol. Arachis	...	Qs.
Ft. haust		

One week after this treatment they were administered Phenovis also, followed by Liquor Arsenicalis for seven days.

The negative cases were treated with Sulpha Mezathine, Creta and Kaolin.

Discussion

In the hills the pastures appear to be highly infested with helminths. Hence a majority of the cases of diarrhoea is due to worm infestations like Strongyles and Amphistomes. 11 animals belonging to 2 owners were treated with Phenovis before the onset of monsoon and at the end of monsoon. These 11 cows were found to be keeping excellent condition. Hence it is a good plan to de-worm the cattle on the hilly areas before the onset of monsoon and immediately after the monsoon.

Recently when I happened to meet some of the local Medical Officers, they also opined that the local human population also suffer heavy infestation of worms.

Non-Specific diarrhoea:—In the Tea and Coffee Estates there is a practice of spraying the Tea and Coffee with "Cuprasona" which may fall on the pasture. This chemical may be an irritant to the intestinal mucosa and might give rise to non-specific diarrhoea.

A PRACTICAL METHOD FOR CAPTURE AND DESTRUCTION OF STRAY DOGS IN A TOWN

By

K. B. Roy,

Senior Health Officer, Bhilai.

The high incidence of bites by stray dogs, the heavy expenditure of maintaining an antirabic centre, and the expenses to a patient to travel to and reside near an antirabic centre for the duration of a complete course of treatment, are wellknown facts in this country. The main difficulties of a regular programme for the control of stray dogs in an Indian town are the lack of a handy method of capture of these dogs in the overcrowded streets and of their destruction humanely and unobtrusively without exciting public attention.

A team of 3 dog catchers were able to destroy more than one thousand stray dogs in a year and the local public, saw practically very little of their activities.

Method of capture

The most popular method in India is by using a pair of tongs; this was found to be rather clumsy unless the dog catchers have strong grips and are very experienced in handling the tongs. The following method was used—

Appliances—

- (1) A strong bamboo rod about 5 ft. long.
- (2) A length of semi flexible steel wire forms an adjustable noose at one end of the above.
- (3) A convenient length of $\frac{3}{4}$ " thick steel rope.

Method

The catchers work from 5 a.m. to 1 p.m. though the peak captures are obtained between 5 a.m. and 7 a.m. when the dogs usually lie down on roads for rest. As soon as a dog is seen, the cage is parked and one man with the pole and wire noose runs quickly to the dog and puts the noose round its neck; the dog is frightened by the fairly tight noose and tries to slip it off its neck which it can easily do unless the other man puts the rope noose on it immediately. The dog is then pushed and dragged into the cage after taking off the wire noose. The rope noose is slipped off or cut off after the dog is inside the cage.

Method of destruction

The dog cage is made of expanded metal net fitted on wooden frames except the floor which is made of wood only. The cage has a tight tailored tarpauline cover touching the ground on all sides: the cover has a round hole about 1 $\frac{1}{2}$ " in diameter just above the floor of the cage, near one corner.

The cage with the captured dogs is parked in a sheltered corner in the compound of the town office of the Public Health Department. At a regular time every day at about 2 p.m. the dog catchers put the tarpauline cover over the cage. A jeep backs up to a distance of about 3 feet away from the cage, a G. I. pipe of adequate diameter connects the exhaust opening of the jeep to the hole in the tarpauline cover; the gear is put in the neutral, the jeep engine is switched on and the choke is pulled out. The jeep engine is kept on for exactly 6 minutes and then switched off. The tarpauline cover is taken off 6 minutes after this by which time all the dogs are dead.

KZ m2, N24

N61-38-3

The advantages of this method of killing are—

- (1) It can be carried out at any part of the town and so does not require the daily transport of a heavy cage to a killing house.
- (2) The dogs die under cover of the tarpauline and the whole procedure is so ordinary looking that it does not attract any public attention.
- (3) There is a low howling by some of the dogs regularly about two minutes after the exposure to the exhaust gases starts but it never continues for more than one minute; this howling is practically inaudible from a distance due to the simultaneous noise of the jeep engine and it probably helps in quicker killing of the dogs concerned by deeper inhalation of the gas.
- (4) The method is quick, certain and safe and practically painless to the dogs.
- (5) The expenditure involved *viz.* petrol consumption is practically negligible if one or two killings are done in a day.
- (6) If exhaust from the municipal diesel garbage trucks can be used then even a much larger number of dogs can be killed in as much or a shorter time.

It is suggested that this method of destruction of captured stray dogs may be given a trial in towns.

Clinical Article

AUTOGENOUS WART VACCINE

By

S. R. CHANDRAN,

Professor of Bacteriology, Kerala Veterinary College.

Warts are cutaneous papillomas occurring in all animals and consist of a thickened hyperkeratotic epidermis and a hyperplastic dermis. The growth may vary in size from a pea to an orange and may be pedunculated or circumscribed at the base. When in large numbers, these growths obstruct natural passages and interfere with their functions. Warts are frequently seen in cattle, and occasionally large numbers of young stock in a herd are found to be affected. When growths are small and few, no ill-effects are usually noticed in an affected animal. The viral etiology of warts has been fairly well-established. Chemotherapy with drugs of choice like anthiomaline,

aricyl, antimosan, Fowler's solution and podophyllum has shown varying extent of response to treatment. Surgical treatment by excision of the growths has also been found to be effective. Commercial wart vaccines have been tried with favourable results in horses and cattle. Foss (1959) has reported that, when commercial vaccine is used, the response to vaccine therapy is slow and not found to be uniform in all animals, but better response is obtained by the use of autogenous wart vaccine. He obtained beneficial results by injecting an autogenous wart vaccine in a horse which had previously failed to respond to commercial vaccine. Noice and Eveleth, quoted by Foss (1959), have also reported success with the use of a similar vaccine in cows. The present report describes trials made with autovaccine on warty calves in the Sindhi herd stationed at the District Live-stock Farm, Trichur.

Experimental Materials

Two calves aged one year and six months, and one year and three months, respectively, formed the experimental animals. The older of the two (Fig. 1) showed extensive lesions of nearly eight months' duration. Massive growths varying in size from a lemon to a tennis ball were present over the face, lips, eyelids, neck region, flank, caudal folds, and tail. The growths were shiny and dark in appearance. The animal had been under a long course of treatment with anthiomaline and arsenicals without any response. Because of the involvement of the lips this calf had great difficulty in eating and drinking from the pail and was in an emaciated condition. The younger animal (Fig. 2) had comparatively few warty growths, and the growths were of four months' duration. This animal had not been subjected to any treatment.



Fig. 1
Older Calf—Before treatment



Fig. 2
Younger Calf—Before treatment

individually pedigreed hens. This is the conclusion of E. W. Henderson, following a study to measure the relationship between fertility rates and hatching rates of fertile eggs. He found, in one instance, that the fertility rate of a hen was only 9%, but the hatching rate of fertile eggs from the same hen was 89%. In another instance, the fertility rate was 100%, but only 41% of the eggs hatched.

(Michigan Quarterly Bull., Vol. 42, No. 4).

B. PANDA.

Vitamin A and Coccidiosis:—After chicks had been infected with coccidiosis, those that received high levels of vitamin A regained their appetite and grew faster than those receiving low levels of this vitamin, according to Jan Erasmus, M. L. Scott and P. B. Levine, New York State College of Agriculture. High levels of vitamin A paralleled increased feed consumption and growth after coccidiosis infection, but it is not known whether the damage caused to the intestinal wall by this parasitic infection may result in poor absorption of fat, thus increasing the requirements for fat soluble vitamins.

(Poultry Sci., Vol. 39, No. 3).

B. PANDA.

Age and Albumen Quality:—Albumen quality during the pullet year does not indicate the albumen quality which may be expected during the second year of production, according to tests by W. J. Muller, A. J. G. Maw and E. G. Buss, Penn State University. They observed that layers having high Haugh units scores during the pullet year, had greater drop in albumen quality from the first to the second year of production than layers which had a low Haugh units score in the pullet year.

(Poultry Sci., Vol. 39, No. 4).

B. PANDA.

Critical tests of Hygromycin B as an Ascaricide of Swine:—By KELLY, G. W. and OSLEN, L. S. (1960). *Cornell Vet.*, 50, 60.

The efficacy of Hygromycin B against *Ascaris lumbricoides* in pigs was studied by adding 6000 units of it per pound of feed. Continued medication for 22 days removed 99% of the worm burden. The egg production per worm was also considerably reduced. The peak of anthelmintic activity was found to occur between the 10th and 15th day of its administration.

V. S. A.

A study of the various approaches for Thoracotomy in Canines:—By WILSON, F. D. (1960). Thesis submitted in partial fulfilment for M. S. degree of Kansas State University.

The author's experimental study of thoracotomy in 11 dogs and 3 cats covered lateral, ventral, transthoracic and cervical methods of approach.

Positive pressure ventilation of lungs was maintained in 2 dogs and 1 cat by E. and J. Resuscitator-Inhalator-Aspirator and in the rest by much less expensive and simpler technique—by periodic blowing into a rubber tubing attached to the exposed end of Magill's intratracheal tubing.

All the cats and 2 dogs succumbed. Fatality in 2 cats was attributed to failure of ventilation process. In others it was due to shock and/or post-operative debility.

In the discussion on various methods of approach the author states ventral (by anterior or posterior sternotomy) and transthoracic approaches (between 5th and 9th ribs) give greater degree of exposure, thus allowing easy accessibility and bimanual exploration. But the posterior sternotomy involves opening of both the thoracic and abdominal cavities and in transthoracic approach there is over exposure of tissues to atmospheric conditions. Accessibility is limited in lateral method which cannot be adopted anterior to 4th rib. In cervical method there is poor visibility and accessibility but it involves least trauma to tissues.

M. S. J.

News and Views

Dr. R. D. Nanjiah:—We are happy to note that Dr. R. D. Nanjiah, B.Sc., G.M.V.C., B.V.Sc., Ph.D., has been appointed as the Principal, Mysore Veterinary College, Bangalore. The College will soon be located in a building of its own. When it is opened it will be one of the most modern of such Colleges and it is but fitting that a young Officer of the calibre of Dr. Nanjiah has been selected to guide and shape the future of that young College. We wish him all success!

* * * *

Dr. G. A. Sastry:—It is a matter of supreme satisfaction to us that Dr. G. A. Sastry, G.M.V.C., B.V.Sc., M.Sc., M.S., Ph.D., Lecturer in Pathology, Andhra Veterinary College, Tirupathi, took his Ph.D., at the Kansas State University, U. S. A., in January 1961. He was the first to take that degree in Veterinary Pathology after the institution

of that award in that famous University. We congratulate both Dr. Sastry and his guide Dr. C. H. Coles, on this happy event. Dr. Sastry took his M. S., degree also and we learn that his research on "Certain Bacterial Canine Nephritides" for the Doctorate degree, was highly appreciated. We most heartily congratulate Dr. Sastry and wish him all success!

Lowering of Standards:—Dr. A. L. Mudaliar, Vice-Chancellor of the Madras University said recently "I am all in favour of changes provided they are comparable to international standards. Otherwise we will be letting loose on the community, thousands of students who have no future to look forward to in these days of severe competition." So the first sufferers will be the students themselves. Let this be clearly understood.

* * * *

Lord Attlee said recently in Madras that democracy is not just a political system. It is a way of life. He hoped that the younger generation would live to see a better world.

* * * *

Cattle Insurance:—The Government of Madras have set apart three lakhs of Rupees for Cattle Insurance in the Third Five Year Plan. What about the other States?

* * * *

What is there in a name?—A rose smells just as sweet even if called by any other name, is what we often hear. Sir Frank Ware, who was the Animal Husbandry Commissioner with the Government of India for some time writes in the *Veterinary Record* "But in India we took the hint some years ago and most of the Provincial Veterinary Departments are now known as Departments of Animal Husbandry. These Departments deal with all questions relating to animals, and the introduction of this arrangement acted like magic. From a state of confusion which previously existed in the minds of administrators and the general public, as to where to go for advice on an animal subject, the picture became suddenly clear and these new Departments began to function like well-oiled machines."

Correspondence

[The views and opinions expressed in correspondence are those of the writers themselves and are not always endorsed by the Editor.]

STAPHYLOTOMY IN A DACHSHUND

BY

WILSON, *et al*,
I.V.J. Vol. 37, 639-642.

Sir,

The subject reported is a nine year old *Dachshund* bitch which showed no symptoms of abnormality or disease till 6 months prior to being admitted for treatment when suddenly "air hunger" on mild exertion and a chronic intermittent cough are described as pronounced symptoms. It is noteworthy that cardiac dilatation detected in the course of examination is attributed to the cough and that no arrhythmia was present even though air hunger was noticed. Perhaps it would have been worthwhile to reproduce the skiagram alongside in evidence of such dilatation.

From the technique of operation described the inference obtained is that a part of the soft palate not including the free border is extirpated by placing two elliptical incisions, though the subsequent lines describing suture method make it clear that in actual fact it is the free border that is excised. Here again it would have been of interest if a photograph of the histopathological picture was also reproduced for the benefit of the readers to indicate to what extent hypertrophy was actually related to the "degenerative changes in the mucous glands in the lamina propria". What occurs to me is that it would have been worthwhile to eliminate gastric or uterine involvement as possible causes for reflex coughing described. But then, so long as the symptom has been controlled by sacrificing a part of the soft palate any further doubt or enquiry ought to be most certainly misplaced as far as a clinician is concerned.

The busy practitioner or administrator is naturally attracted by spot head lines and short summaries. The latter in this case however did appear very intriguing.

English language being what it is, most readers might have found it difficult to sort out many ideas described. To cite only one example see the first line which states that congenital elongation of the soft palate is resected successfully. Critics might also have some thing to say about the use of the word staphylotomy itself which strictly would

mean excision of the UVULA. If so staphyloplasty might have been the word of choice.

27-12-1961.

M. N. MENON,
Principal, Veterinary College,
Mannuthy, Trichur.

REPLY

Sir,

With reference to Sri M. N. Menon's letter, I offer the following remarks.

(1) A Skiagram as suggested by Sri M. N. Menon had been taken. Since cardiac dilatation was detected on examination itself, the Skiagram apart from being of help to the clinician in confirming his diagnosis has little bearing on the condition itself or on the operative technique elaborated.

(2) The histopathological picture of the extirpated tissue would have been a useful addition to the article. Unfortunately the facilities available to me were not sufficient for such microphotographs of histopathological sections.

(3) If the summary I have given under the article is too long or intriguing for a busy practitioner like Sri M. N. Menon, I have only to apologise.

(4) Excision of the uvula is termed Staphylectomy and not Staphylotomy, which is the removal of a part of the uvula or incision of the uvula. As no plastic surgery of the uvula was performed, the term Staphyloplasty does not fit into the picture.

Vepery, }
10-2-61. }

F. D. WILSON.

Association News

The Indian Veterinary Association

THE RESERVE FUND

An event of great importance to the Veterinary profession in India, took place in August 1924. It was the birth of the *Indian Veterinary Journal*. Circumstances were positively hostile and yet the profession took that bold step and the lion-heartedness of the early

pioneers cannot be too highly praised. Ever since then, the *I.V.J.* has toiled hard under very adverse circumstances. The *I.V.J.* lives to-day so that the profession could prosper and science advance.

And now the hat is sent round so as to place this journalistic venture on a sounder and firmer basis. The *I.V.J.* is a priceless possession of our profession. It has placed the Indian Veterinary Surgeon, on the map of the scientific world. Just pause and ponder over, how much we owe to the Journal both individually and collectively. Is it too much then to expect the profession to respond to the appeal issued for a Reserve Fund? We hope not.

Some enquiries have come to us asking us to indicate the extent of help expected. We do not want to put the members of the profession to any undue financial strain in these hard days. At the same time, a certain amount of sacrifice is needed to make this fund a great success, so as to make it worthy of our profession. So we feel that the following scale of contribution will be quite reasonable. It could even be paid in two or three instalments.

Class I Officers	...	Rs. 100/- and above.
Class II Officers	...	Rs. 50/- and above.
All others	...	Rs. 25/- and above.

It is our ambition that no Veterinary Surgeon in this land should remain without contributing to this fund. Brick by brick, this great edifice of ours should begin to rise higher and higher. On the success or otherwise of this venture, the solidarity of our profession depends. "Pay and Prosper" is the slogan we pass on to the members of our profession.

Jai Hind!

T. VINAYAKA MUDALIAR,
Editor, *The Indian Veterinary Journal*.

THE I. V. J. RESERVE FUND

LIST OF CONTRIBUTORS

	Rs. nP.
Amount acknowledged (Feb. 1961 issue)	...
Dr. R. L. Deb, D. V. O. Aijal, Assam. (2nd Instalment)	... 5,146.05
" S. M. Lokanath, Hadagalli, Mysore, (1st Instalment)	... 10.00
	... 12.00
Total	... 5,168.05

Cheques, money orders and all correspondence should be addressed to the Editor, *The Indian Veterinary Journal*, Madras-17.

THE U. P. VETERINARY ASSOCIATION

Proceedings of the Executive Committee Meeting
held at Lucknow on the 15th & 16th January 1961

15th January 1961-Badshahbagh-11.00 A. M.

The following attended :—

S/Sri H. C. Joshi, K. A. Raza, A. N. Dwivedi, S. N. Rai,
B. R. Singh, K. L. Shani, V. S. Srivastava, H. P. Kapoor & Tej Bahadur
(by proxy).

Resolutions passed:—

1. The General Secretary read out the letter received from the Director of Animal Husbandry intimating that the gradation list of Group II Officers is under print and shall be circulated when ready. The gradation list of Group I Officers is yet awaited from the Public Service Commission and shall be circulated when received.

2. The General Secretary gave his report on resolution No. 15 of 10th September 1960 about holding the Annual General Meeting at Varanashi. The question of holding the same at Aligarh during the State Livestock Show was also thoroughly considered and it was then resolved that the Annual Meet should be held at Lucknow and May 12th. & 13th. were provisionally fixed for the same.

3. It was further resolved that the Chief Minister, Uttar Pradesh be requested to kindly inaugurate the function.

4. It was resolved that the reserve fund of Rs. 1000 may now be deposited in the Co-operative Bank if the rate of interest is 5% or above but if it is less, then it may be placed in the Animal Husbandry Co-operative Society where 5% interest is said to be available.

5. Resolved that Local Associations at District Levels subordinate to the Parent Body be formed and for which rules be framed by the General Secretary and further action taken by him.

16th January 1961—Badshahbagh-1.30 P. M.

All those who attended on 15th were present.

6. It was resolved to hold the next election of the President strictly according to rules and accordingly the following were nominated :—

- | | |
|----------------------------|-----------------------|
| (i) Sri C. V. G. Chowdhary | (iii) Sri R. N. Desai |
| (ii) Sri H. C. Joshi | (iv) Sri M. L. Verma |

7. The following sub-committee was appointed to conduct the above election ;—S/Sri K. A. Raza, K. L. Sahani & H. P. Kapoor.

8. Resolved unanimously that Sri M. R. Mahajan, Director of Animal Husbandry, U. P. be requested to kindly become a 'Patron' of our Association.

9. Resolved that the Government be moved to kindly review their policy in withholding application for higher/foreign trainings and for appointments elsewhere, in view of the fact that there is no shortage of staff now in the State and that the Government of India have also already relaxed this condition in the services under them. Such an action on the part of our Government also will go a long way in removing frustration and discontentment prevailing among the staff and would naturally result in satisfaction and greater efficiency.

H. P. KAPOOR,
General Secretary.

Reviews

Vibrio Fetus Infection of Cattle :—EDITED BY J. A. LAING, Royal Veterinary College, University of London ; Published by FAO, Rome, 1960. 62 pages.

Prof. Laing's second and revised edition of *Vibrio fetus* infection in cattle published under the auspices of FAO is a highly useful compendium of latest information on the subject gathered from many a country confronted with the problem.

The subject matter is dealt in 7 chapters running to 62 pages and covers from bacteriology of *Vibrio fetus* to prevention and control. Two types of *Vibrio fetus* have been recognised. One is *V. fetus* (venerealis) which is the natural pathogen associated with infertility and abortion in cows and the other type is *Vibrio fetus* (intestinalis) the cause of sporadic abortion in sheep and cows. The various methods of preparation of antigen listed for diagnosis by serological methods remind us that the standardisation of Veterinary biologicals for universal application seems to be a long way off.

The clarity of expression and the flair to detail information in a comprehensive manner should make the report a 'Must' in the studies of those tackling the problem whether in the laboratory or in the field.

M. S. J.

Nagpur Veterinary College Magazine :—Vol. I, Jan. 1961.

We welcome the first issue of this magazine and congratulate the Magazine Committee for being able to bring out this number within a short period after the inauguration of the College. Besides interesting contributions in English by the staff and students, scientific literature in Marathi language is also presented in a separate section.

V. S. A.

THE INDIAN VETERINARY JOURNAL

individually pedigreed hens. This is the conclusion of E. W. Henderson, following a study to measure the relationship between fertility rates and hatching rates of fertile eggs. He found, in one instance, that the fertility rate of a hen was only 9%, but the hatching rate of fertile eggs from the same hen was 89%. In another instance, the fertility rate was 100%, but only 41% of the eggs hatched.

(Michigan Quarterly Bull., Vol. 42, No. 4).

B. PANDA.

Vitamin A and Coccidiosis:—After chicks had been infected with coccidiosis, those that received high levels of vitamin A regained their appetite and grew faster than those receiving low levels of this vitamin, according to Jan Erasmus, M. L. Scott and P. B. Levine, New York State College of Agriculture. High levels of vitamin A paralleled increased feed consumption and growth after coccidiosis infection, but it is not known whether the damage caused to the intestinal wall by this parasitic infection may result in poor absorption of fat, thus increasing the requirements for fat soluble vitamins.

(Poultry Sci., Vol. 39, No. 3).

B. PANDA.

Age and Albumen Quality:—Albumen quality during the pullet year does not indicate the albumen quality which may be expected during the second year of production, according to tests by W. J. Muller, A. J. G. Maw and E. G. Buss, Penn State University. They observed that layers having high Haugh units scores during the pullet year, had greater drop in albumen quality from the first to the second year of production than layers which had a low Haugh units score in the pullet year.

(Poultry Sci., Vol. 39, No. 4).

B. PANDA.

Critical tests of Hygromycin B as an Ascaricide of Swine:—By KELLY, G. W. and OSLEN, L. S. (1960). *Cornell Vet.*, 50, 60.

The efficacy of Hygromycin B against *Ascaris lumbricoides* in pigs was studied by adding 6000 units of it per pound of feed. Continued medication for 22 days removed 99% of the worm burden. The egg production per worm was also considerably reduced. The peak of anthelmintic activity was found to occur between the 10th and 15th day of its administration.

V. S. A.

NEWS AND VIEWS

A study of the various approaches for Thoracotomy in Canines:—By WILSON, F. D. (1960). Thesis submitted in partial fulfilment for M. S. degree of Kansas State University.

The author's experimental study of thoracotomy in 11 dogs and 3 cats covered lateral, ventral, transthoracic and cervical methods of approach.

Positive pressure ventilation of lungs was maintained in 2 dogs and 1 cat by E. and J. Resuscitator-Inhalator-Aspirator and in the rest by much less expensive and simpler technique—by periodic blowing into a rubber tubing attached to the exposed end of Magill's intratracheal tubing.

All the cats and 2 dogs succumbed. Fatality in 2 cats was attributed to failure of ventilation process. In others it was due to shock and/or post-operative debility.

In the discussion on various methods of approach the author states ventral (by anterior or posterior sternotomy) and transthoracic approaches (between 5th and 9th ribs) give greater degree of exposure, thus allowing easy accessibility and bimanual exploration. But the posterior sternotomy involves opening of both the thoracic and abdominal cavities and in transthoracic approach there is over exposure of tissues to atmospheric conditions. Accessibility is limited in lateral method which cannot be adopted anterior to 4th rib. In cervical method there is poor visibility and accessibility but it involves least trauma to tissues.

M. S. J.

News and Views

Dr. R. D. Nanjiah:—We are happy to note that Dr. R. D. Nanjiah, B.Sc., G.M.V.C., B.V.Sc., Ph.D., has been appointed as the Principal, Mysore Veterinary College, Bangalore. The College will soon be located in a building of its own. When it is opened it will be one of the most modern of such Colleges and it is but fitting that a young Officer of the calibre of Dr. Nanjiah has been selected to guide and shape the future of that young College. We wish him all success!

* * * *

Dr. G. A. Sastry:—It is a matter of supreme satisfaction to us that Dr. G. A. Sastry, G.M.V.C., B.V.Sc., M.Sc., M.S., Ph.D., Lecturer in Pathology, Andhra Veterinary College, Tirupathi, took his Ph.D., at the Kansas State University, U. S. A., in January 1961. He was the first to take that degree in Veterinary Pathology after the institution

Statement about ownership and other particulars about newspaper THE INDIAN VETERINARY JOURNAL to be published in the first issue every year after last day of February.

FORM IV

(See Rule 8)

1. Place of Publication ... Madras.
2. Periodicity of its publication ... Monthly.
3. Printer's Name ... T. Kannubiran, Paramount Press, (Props: Jaya & Co.)
Nationality ... Indian.
Address ... 582/588, High Road, Triplicane, Madras-5.
4. Publisher's Name ... The Indian Veterinary Association.
(Rao Sahib T. Vinayaka Mudaliar, Publisher and Editor).
Nationality ... Indian.
Address ... 7, First Street, Vidyodaya East, T'Nagar Madras-17.
5. Editor's Name ... Rao Sahib T. Vinayaka Mudaliar.
Nationality ... Indian.
Address ... 7, First Street, Vidyodaya East, T'Nagar, Madras-17.
6. Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital ... The Indian Veterinary Association.
7, First Street, Vidyodaya East, T'Nagar, Madras-17.

I, T. Vinayaka Mudaliar, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Dated 1st March 1961.

T. VINAYAKA MUDALIAR,
Publisher and Editor.

IDEAL VETERINARY REMEDIES

- ★ WORMIX - For eradicating Roundworms and Threadworms in Livestock, Poultry and Dogs. Bottles of 2 oz. and 16 oz.
- ★ SULPHAMIX - Ideal treatment for coccidiosis in Poultry and bowel infections in livestock and Dogs. Bottles of ½ oz. and 4 oz.
- ★ MINIMIX - Well balanced Mineral Mixture for milk producing cattle. Promotes growth and increases milk. Packings of 1 lb. and 25 lbs., & 100 lbs.

Manufactured by the Anidiet Brand famous
Dog Biscuits and Poultry Food Manufacturers:

CHELSEA CHEMICAL LABORATORIES

Hadapsar Industrial Estate, Poona-1. PHONE : 4453



POULTRY BOOKS

	Rs.	nP.
ROGER-CAMPBELL: Profitable Poultry Keeping in India illtd.	...	1 75
MARSHALL: Egg Incubation 1952 illtd.	...	1 87
MORRIS: Poultry Keeping for Profit illtd.	...	6 37
FELTWELL: Intensive Methods of Poultry Management 1953	...	3 20
MARKETING FARM POULTRY 1953 43 illns.	...	2 50
SMITH: How to Win Prizes with Poultry 1958	...	2 50
WILSON: Handbook of Poultry Practice 1953 fully illtd.	...	7 87
GRAY: Diseases of Poultry 1955 illtd.	...	10 50
HURD: Modern Poultry Farming 1956 fully illtd.	...	37 50

Order from

SARCOR BOOK COMPANY

PALLIARAKAV ROAD — MATTANCHERI — COCHIN 2 (S. INDIA).

When writing to advertisers, please mention *The Indian Veterinary Journal*.

ADVERTISEMENTS

Telegram — CRESCENT

Telephone — 34-3404

Rinderpest Eradication Scheme

BRAND VACCINATED ANIMALS WITH "P.E.W. BRANDING INK"

Beware of Imitation — Do not be misled by spurious makes

A scientific chemical combination.

Produces a lasting and distinctly visible brand, usable on Cattle and Buffaloes and other domesticated animals. Application is very easy, quick and absolutely economical. No wastage. Already in use in all Indian States. Innumerable animals have been branded in all States under Rinderpest Eradication Scheme with success.

It permeates into the layers of the skin evenly upto follicular layer over the branded area and forms an antiseptic dry scab that peels off in a few weeks, leaving a well defined visible brand mark. It does not produce any open wound and thus prevents extraneous infection.

Approved by

**CENTRAL RINDERPEST CONTROL COMMITTEE,
NEW DELHI.**

**ALREADY SUPPLIED TO ALL THE DIRECTORATES OF
VETERINARY SERVICES AND ANIMAL HUSBANDRY
IN INDIA.**

TRY ON YOUR ANIMALS ALSO.

This can be supplied in any quantity on order. Use our make special type of Branding Iron manufactured for the purpose.

**G.T.V. SETS AND STAINLESS G.T.V. NEEDLES
ARE ALSO SUPPLIED BY US.**



For further particulars, please apply to:

PAUL'S ELECTRO WORKS

39, JORAPUKER SQUARE — POST BOX No. 11406

CALCUTTA - 6

When writing to advertisers, please mention *The Indian Veterinary Journal*.